DRAFT

ENVIRONMENTAL IMPACT STATEMENT PRICE COALBED METHANE PROJECT

Prepared by:
Bureau of Land Management
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The Bureau of Land Management is responsible for the balanced management of public lands and resources and their various values so that they are considered in a combination that will best serve the needs of the American people. Management is based upon the principles of multiple use and sustained yield; a combination of uses that takes into account the long term needs of future generations for renewable and nonrenewable resources. These resources include recreation, range, timber, minerals, watersheds, fish and wildlife, wilderness, and natural, scenic, scientific and cultural values.

This Environmental Impact Statement was prepared by Woodward-Clyde, an environmental consulting firm, with the guidance, participation, and independent evaluation of the Bureau of Land Management (BLM). The BLM, in accordance with Federal Regulation 40 CFR 1506.5 (a) and (c), is in agreement with the findings of the analysis, and approves and takes responsibility for the scope and content of this document.

DRAFT ENVIRONMENTAL IMPACT STATEMENT

PRICE COALBED METHANE PROJECT

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
MOAB DISTRICT OFFICE
UTAH

OCTOBER 1996

UTAH STATE DIRECTOR
BUREAU OF LAND MANAGEMENT

☐ Legislative ☒ Executive

COVER SHEET
DRAFT ENVIRONMENTAL IMPACT STATEMENT

PRICE COALBED METHANE PROJECT

Lead Agency: U.S. Department of Interior
Bureau of Land Management, Moab District Office

Jurisdictions in Utah that could be directly affected: Carbon and Emery Counties

Abstract: River Gas Corporation proposes to develop a coalbed methane (CBM) gas production field in the Price area of Carbon County, Utah. Surface and mineral estate ownership of the 290-square mile project area is divided among Bureau of Land Management (BLM), Utah School and Institutional Trust Lands Administration (state), Utah Division of Wildlife Resources (UDWR), and private landowners. This EIS addresses the impacts of the construction, drilling, and completion/stimulation of 601 CBM gas wells and associated wellpads, access roads, pipelines, and electrical distribution lines over approximately 10-plus years. In addition to the Proposed Action, six alternatives are defined and evaluated, including: (1) Alternative A - field development at 80-acre well spacing; (2) Alternative B1 - Critical Areas Avoidance (160-acre well spacing) - restriction of CBM well development on federal lands to areas outside of critical elk and mule deer winter range; (3) Alternative B2 - Critical Areas Avoidance (80-acre well spacing); (4) Alternative C1 - Security Areas Protection (160-acre well spacing) - restriction of CBM well development on federal and UDWR lands to areas outside of security habitat areas within critical elk and mule deer winter range; (5) Alternative C2 - Security Areas Protection (80-acre well spacing), and (6) No Action Alternative - continued development on state and private lands with rights-of-way access across BLM-administered federal lands. BLM has identified Alternative C1 as the preferred alternative.

EIS Contact: Comments on this Draft EIS should be directed to:

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Date Draft EIS Filed with USEPA: October 18, 1996

Dates of Public Hearings: November 13, 1996, 7 p.m., Carbon County Commission Chambers, Price; November 14, 1996, 7 p.m., Emery County Commission Chambers, Castle Dale

Date by which comments are due: December 2, 1996. Written comments should be received by close of business, 5:00 p.m. Please include your name and complete mailing address on all written comments.

River Gas Corporation (RGC) has notified the Bureau of Land Management (BLM), the Price River and San Rafael Resource Areas, of the company's intent to develop a coalbed methane (CBM) field in an area adjacent to the City of Price, Utah. RGC holds valid federal, state, and private oil and gas leases in the Project Area, which have created contractual and property rights for RGC from the United States, the State of Utah, and private mineral landowners, to develop the CBM gas resources. Within economic limits, the purpose of the RGC Proposed Action is to remove all recoverable CBM gas within the portion of the Project Area leased by RGC. RGC currently holds leases on approximately 123,000 acres within the 188,242-acre Project Area. Approximately 82,741 acres are federal surface (44 percent) within the Project Area, and an additional 12,721 acres (7 percent) are federal mineral ownership with state or private surface ownership.

Under the requirements of the National Environmental Policy Act (NEPA), BLM is required to analyze proposed actions involving federal lands and leases in terms of their potential impact on the human environment. This Draft Environmental Impact Statement (EIS) was prepared by Woodward-Clyde for the U.S. Department of the Interior, BLM, Moab District and Price office. The BLM, Utah State Director is the responsible official for the preparation of the EIS, and for issuing a final decision.

The BLM will accept public and agency comments on the proposed project during the public comment period (October 18, 1996 to December 2, 1996). Additionally, public hearings will be held in Price and Castle Dale, Utah, on November 13 and 14, 1996, to receive comments on the adequacy and accuracy of the EIS. Comments and issues brought forth during the review of the EIS will be addressed in the Final EIS.

The BLM will consider the Proposed Action and alternatives analyzed in the Final EIS and issue a decision on the project. The final decision and rationale will be presented in a document known as the Record of Decision (ROD). The BLM will either approve or deny future applications for facilities; permits to drill; and rights-of-way for field development of CBM by lessees with lease holds in the Project Area. The BLM's decisions will be based on conformance of the applications with the mitigation and development-exclusion areas specified in the ROD for the proposed development analyzed in this EIS. Mitigation and development-exclusion areas may be required in the ROD and future decisions on site-specific applications to minimize impacts to other resources and resource users, and to avoid unnecessary and undue degradation of the environment or violation of applicable laws and regulations. Additional site-specific reviews for NEPA compliance will be required for future applications and will be tiered to this EIS. The BLM ROD will apply to the portions of the Project Area that are federal surface or federal mineral estate. Federal mineral estate includes full-estate federal lands, or split-estate lands with federal subsurface and private or state-owned surface. Decisions by other jurisdictions to issue or not to issue approvals related to this proposal may be aided by the disclosure of impacts in this EIS. BLM may withhold final approval of Applications for Permit to Drill (APDs) and rights-of-way pending approval by the state, other federal agencies, and private landowners.

This summary of the Draft EIS contains a description of the Proposed Action and alternatives, identifies the BLM's preferred

alternative; summarizes existing environmental conditions, analyzes various issues, and discloses the major impacts of the proposed project and the various alternatives upon the environment.

PROPOSED ACTION AND ALTERNATIVES

Project Description (Proposed Action)

The Proposed Action would entail development of (1) approximately 601 wells, (2) approximately 350 miles of transportation corridors (access roads, pipelines, and utilities) and 51 miles of pipeline corridors, and (3) related facilities including 5 compressor stations, 7 injection wells, and 7 produced water evaporation ponds. These facilities would be developed over an estimated 10^{+}-year period. About 60 percent of the wells would be located on federal land or federal mineral estate, and the remainder would be on lands owned by the Utah Division of Wildlife Resource, Utah Institutional and Trust Lands Administration, and private lands. Individual wells would remain operational for about 20 years, and would be closed and abandoned at the end of the project. The total area affected over the life of the project on federal surface lands would be about 4,095 acres, and about 2,353 acres would be occupied by surface facilities, including wells, roads, compressor station, injection wells, and evaporation ponds. An additional 208 acres of split-estate lands would be affected during construction, and 119 during operation. BLM restrictions on well development within 1/2 mile of an active raptor nest would affect 17 of the proposed wells. Areas closed to unauthorized vehicle use when big game are on their critical winter habitat would effect 189 wells and 115 miles of transportation corridors.

From 1991 to 1995, RGC developed 97 wells, 58 miles of transportation corridor, one compressor station, one injection well, and one evaporation pond; all within the Drunkards Wash Unit on state and private land. All wells and other facilities described for the Proposed Action and other alternatives are additional to these existing facilities.

RGC has proposed to develop 4 CBM wells per square mile (160-acre spacing), in accordance with the procedures and guidelines of the Utah Division of Oil, Gas and Mining (UDOGM) and the BLM. Well pads would be about 300 x 200 feet and would include a 50 x 50 foot drilling pit. Three classes of roads would be constructed or upgraded from existing roads: collector roads (travel width of 24 feet, design speed 25 mph); local roads (travel width of 20 feet, design speed of 20 mph), and resource roads (travel width of 16 feet, design speed of 15 mph). Four types of pipelines would be constructed, including 2- to 18-inch diameter gas gathering and produced water pipelines, and high pressure 12-inch diameter delivery and interconnect pipelines. Electrical lines would be installed underground.

Final well depths would be about 1,400 to 3,800 feet deep, and would be completed in the Ferron Sandstone. Vertical air drilling techniques would be used unless special conditions require drilling mud. Two to six drill rigs would be operational during the drilling period (April 15 to December 15). An average of 4 days would be required for drilling each well. Each well would be cased with 8 5/8-inch to 9 5/8-inch surface casing to a depth of 300 feet, and 5 1/2-inch to 7-inch production casing to total well depth. The entire length of casing would then be cemented into place. Well completion would last 7 to 14 days and would include perforating the well's steel casing,

hydraulically fracturing the producing formation, and installing a series of valves and fittings on the wellhead ("Christmas tree").

Installed surface production facilities would include the Christmas tree, a walking beam pumping unit, separation facility, gas metering facility, and connections to the gas and water collection systems. Each well would be visited about once every 3 days to ensure that the equipment is operating properly. A central computer based monitoring system would also be used to monitor wellsite operating conditions.

Each compressor station would occupy about 5 acres, and would utilize 6 to 17 1,700 HP compressor units, electrical or gas-fired with clean-burn control technology. Produced water would be disposed of in injection wells (about 8 acres each) and evaporation ponds (about 4 acres each). Produced water would have roughly 6,500 to 9,000 parts per million total dissolved solids. The injection wells would be completed into the Navajo, Entrada, Wingate, and Curtis formations, and are anticipated to take at least 10,000 barrels of water per day. Evaporation ponds would be approximately 400 x 400 feet and 9 feet deep. They would employ an active spray process to enhance evaporation to an annualized daily minimum of 5,000 barrels of water per day, and would be constructed with liners and leak detection systems.

At the end of the economic life of each well (estimated to be 20 years), final reclamation and abandonment procedures would include removal of all surface equipment, reclaiming and seeding of wellsites and access roads, and abandonment of pipelines in place.

Construction, operation and abandonment activities would be conducted in compliance with federal, state, and local laws and regulations. In addition, various environmental protection measures would be applied, but would vary by land ownership. They include measures developed by RGC and applicable to all lands; by BLM for lands under federal surface and mineral ownership; by Utah Division of Wildlife Resources for lands under its control, and by the State of Utah for State Institutional and Trust Lands. For private lands, Utah Division of Oil, Gas and Mining, BLM guidelines and RGC standard operating procedures require that RGC attempt to negotiate a surface use agreement with the landowner prior to construction.

Issues

Public issues and comments regarding the Price CBM Project were solicited for incorporation into this EIS through a scoping process, including public scoping and agency project review. A public scoping meeting was held in Price, Utah, on September 8, 1994, and an agency scoping meeting on September 15, 1994. The Public Scoping Summary Report was prepared and submitted to the public on January 30, 1995. The summary report identified preliminary land and resource management issues, concerns, and opportunities, and outlined timing needs for public involvement. Issues raised during scoping and through the NEPA process and addressed by alternative in Chapters 3 and 4 of the EIS include:

- Geology: protection of coal reserves
- Water resources: produced water withdrawal and disposal, freshwater needs, effects of runoff on surface water bodies

- Air quality: effect of emissions from construction and operation, visibility, dust, cumulative effects

- Soils: effects on highly erodible soils and highly saline soils

- Vegetation: loss of vegetation especially pinyon-juniper and riparian, noxious weeds, reclamation

- Wetlands: loss of wetlands

- Wildlife: direct and indirect effects on mule deer, elk, black bear, mountain lion, sage grouse, prairie dogs, raptors

- Special status species: Effects on bald eagle,-Colorado River fish and other listed species, effects on spotted bat, burrowing owls and other sensitive species

- Cultural resources: direct and indirect effects on archaeological sites, effects on sites of Native American religious or cultural significance

- Land use: conformity with existing plans, land use compatibility, land jurisdiction

- Livestock management: reduction of livestock carrying capacity, effects on livestock management, effects on facilities

- Recreation: loss of dispersed recreation including trails, effects on hunting

- Visual resources: effects on scenic quality

- Noise: increased noise during construction and operation

- Socioeconomics/quality of life: increased traffic, jobs, loss of tourism income, effects on tax base

- Health and safety: handling and disposal of wastes, use of hazardous materials

Several additional issues were raised during scoping, but not analyzed in detail by alternative. Analysis of these issues found that impacts would be negligible or the same for all alternatives. These issues are discussed in Chapter 1.

Summary Description of Alternatives

Alternative A - 80-Acre Well Spacing

The future performance of wells may indicate that closer spacing of wells is required for optimal recovery of CBM gas. To address this possibility, Alternative A includes an 80-acre well spacing (8 per square mile). With Alternative A, 1,103 CBM wells would be drilled, completed, and produced within the same Project Area and time period. Project activities would be the same as for the Proposed Action, but the number of wells and miles of transportation corridor would increase by 83 and 48 percent, respectively.

Alternative B - Critical Areas Avoidance

The critical areas avoidance alternative was developed to reduce potential impacts to mule deer and elk critical winter habitat. Under this alternative there would be no development on federal surface or mineral estate within the combined area of critical winter range. Project activities would be the same as for the

Proposed Action outside of these areas, and on non-federal surface or minerals.

There are two subalternatives for Alternative B, based on well spacing. For Alternative B1, (160-acre spacing), there would a 28 percent decrease in the number of wells, and a 48 percent decrease in the number of miles of transportation corridor, compared to the Proposed Action. In addition, 2 injection wells and evaporation ponds located within critical winter range would be eliminated. With Alternative B2 (80-acre spacing), there would be a 25 percent decrease in the number of production wells and a 30 percent decrease in the number of miles of transportation corridor, compared to Alternative A.

Alternative C - Security Areas Protection

The security areas protection alternative was also developed to reduce potential impacts to mule deer and elk critical winter habitat. Under this alternative there would be no development on federal surface or mineral estate on important concentration areas for mule deer and elk within their winter range. There would similarly be no development within security areas located on lands controlled by the Utah Division of Wildlife Resources. These areas would serve as secure habitat where big game would be protected from disturbance and stress associated with CBM field development, and all CBM surface activity would be prohibited. Outside these areas, project activities would be the same as described for the Proposed Action and Alternative A.

There are two subalternatives for Alternative C, based on well spacing. For Alternative C1, (160-acre spacing), there would an 8 percent decrease in the number of wells, and a 12 percent decrease in the number of miles of transportation corridor, compared to the Proposed Action. With Alternative C2 (80-acre spacing), there would also be an 8 percent decrease in the number of production wells and an 8 percent decrease in the number of miles of transportation corridor, compared to Alternative A.

No Action

Denial of well development on federal mineral estate would preclude activity on much of the federal lands within the Project Area. However, development on state and private lands would likely occur, and for analysis purposes was assumed to be as the Proposed Action on non-federal lands. Access across federal surface to reach proposed well locations on state and private lands would likely be granted by the BLM. The number of wells would be reduced by 62 percent, and the number of transportation corridor miles by 56 percent compared to the Proposed Action. In addition, the number of injection wells and evaporation ponds would be reduced by 3 each.

Agency Preferred Alternative

In accordance with NEPA, Federal agencies are required by the Council on Environmental Quality regulations (40 CFR 1502.14) to identify their preferred alternative in the Draft EIS. The preferred alternative is not a final agency decision; but rather an indication of the agency's preliminary preference. This preference may be changed in the Final EIS based on additional information developed from comments on the Draft EIS.

The BLM preferred alternative for the Price CBM Project is Alternate C1 - security areas protection with 160-acre well spacing.

AFFECTED ENVIRONMENT

Chapter 3 of the Draft EIS describes environmental, economic and social conditions as they currently exist within the study area. Following is a brief summary of this affected environment.

The Project Area covers approximately 294 square miles (188,000 acres). It includes the communities of Price, Wellington, Carbonville and Spring Glen, and extends south to about 2 miles north of Cleveland, and four miles north of Huntington. It is bounded on the west by the Wasatch Plateau, and on the north by the Book Cliffs.

The Project Area is located within the Mancos Shale Lowlands Section of the Colorado Plateau, and Mancos Shale covers nearly the entire area. The landscape of the western portion of the study area is characterized by sloping, gravel-covered pediments and narrow, flat-bottomed alluvial valleys. The eastern portion of the Project Area is relatively flat, with some lower benches. Elevation in the Project Area ranges from about 5,400 to 7,800 feet. Coal is not currently mined within the Project Area, but some coals of the Ferron Sandstone may be mineable. There are four coal fields located nearby - Book Cliffs, Wasatch Plateau, Emery, and Northern Emery.

The majority of the Project Area is within the watershed of the Price River, which is the largest river in the area. Other perennial streams are located mainly in the western half of the Project Area, and include Gordon Creek and several of its tributaries, Miller Creek, and Cedar Creek. There are approximately 90 springs and seeps, also mainly in the western half. The water quality of streams generally degrades as it goes from the Wasatch Plateau and Book Cliffs into the lowlands, because of the highly saline nature of the Mancos Shale. Six groundwater aquifers are present including the Quaternary alluvium along major streams, the Ferron Sandstone Member of the Mancos, and the Curtis Formation, Navajo-Nugget, and Entrada Sandstone. The Ferron Sandstone is not currently used as an aquifer within or adjacent to the Project Area, and total dissolved solids (TDS) concentrations range from 6,500 to 9,500 mg/L. The Curtis, Entrada and Navajo-Nugget are also not currently used as aquifers in or near the Project Area. The Navajo-Nugget is an important aquifer elsewhere, but is deep and has poor water quality in the Project Area.

The climate east of the Wasatch Mountains is generally characterized by hot, dry summers, and cold, dry winters. The area is subject to prolonged and intense inversions, which occur in both winter and summer. During the winter inversions may persist until a strong storm system moves throughout the area. The Project Area is classified as a Class II attainment area under Prevention of Significant Deterioration (PSD) regulations, meaning that no state or federal standards are currently being exceeded. The existing visual range is excellent, but has decreased in recent years.

About 38 percent of the Project Area has a high to severe potential for water erosion, and about 35 percent of the area is currently undergoing accelerated erosion due to high intensity storms, broken irrigation canals, and irrigation runoff. Most of the rest of the Project Area is rated moderate for water erosion. None of the soils in the Project Area have a high potential for wind erosion, but about half have a moderate potential. About 4 percent of the soils are rated very high for salinity, and about 39 percent are rated as moderately to highly saline. Seven percent of the Project Area is unsuitable as a source of

reclamation material because there is little or no soil material available, and 39 percent is poor because of very high salinity and/or existing gullying. Most of the areas of poor suitability are located in the eastern half of the Project Area.

The eastern half of the Project Area has salt desert vegetation in uncultivated areas, with large patches of irrigated agricultural lands, several urbanized areas, and areas of riparian and wetland vegetation. The western half is mostly sagebrush-grass on loamy soils and more level sites, with pinyon-juniper on steeper slopes and on shallow or rocky soils. Small areas of montane and subalpine forest, mountain shrub and barren land occur along the western and northern boundaries of the Project Area, at the edge of the Wasatch Plateau and Book Cliffs. Several State or County-designated noxious weeds occur within the study area. Much of the Project Area has significant limitations for re-establishment of disturbed vegetation.

Wetlands potentially under the jurisdiction of Section 404 of the Clean Water Act are present mainly near agricultural areas in the eastern half of the Project Area, and are related to irrigation practices. Smaller natural wetlands occur along perennial streams and at springs and seeps.

Much of the western half of the Project Area consists of critical and high value mule deer and elk winter habitat. High value yearlong habitat for pronghorn antelope is present east of Highway 10. Black bear high value yearlong habitat and moose limited value winter habitat occur in the northwestern corner of the Project Area. The Gordon Creek Wildlife Management Area occupies about 23,000 acres in the northwestern portion of the Project Area, and is managed mainly for deer, elk, and moose. At least 8 raptor species regularly occur and nest within the Project Area, with golden eagle the most common. Historic sage grouse habitat is present on some of the benches. Nearly 7,000 acres of white-tailed prairie dog towns are present.

The only listed endangered or threatened species known to occur in the Project Area are bald eagle (wintering), and peregrine falcon (nesting). Sensitive species include northern goshawk, ferruginous hawk, western burrowing owl, loggerhead shrike, spotted bat, and two plant species. Several endangered, threatened or sensitive fish species are also present in the Colorado River, downstream of the Project Area.

Areas assessed as having a high sensitivity for cultural resources occupy 46 percent of the Project Area, and include corridors along streams above 6,000 feet elevation, springs, historic coal mining areas, and areas of intensive agricultural development in historic times. Moderate sensitivity areas occupy about 44 percent, and include all uplands above 6,000 feet, marginal agricultural lands, and areas of low-production coal mining. Low sensitivity areas include salt desert areas and steep slopes.

The Project Area lies within southern Carbon County and northern Emery County. Two incorporated towns are present, Price and Wellington, along with the unincorporated communities of Spring Glen and Carbonville, and dispersed residential areas. Existing land uses include rural communities; mineral exploration and production facilities; transportation and utility corridors; agriculture; grazing; wildlife habitat, and dispersed recreation. Major highways include State Routes 10 and 122, and U.S. 6; there is an extensive network of county roads, BLM roads, and roads recently constructed by RGC for development of CBM wells. In general,

traffic volumes are low because of the sparse population.

The BLM manages 27 grazing allotments completely or partially within the Project Area. About 6 to 35 acres are required to produce an animal unit month (AUM), depending on plant production. Cattle and sheep are the primary livestock types. Season of use varies by allotment, and includes all seasons. About half of the public lands are rated as being the mid-seral (fair) condition.

Dispersed recreational activities on public lands within the Project Area include hunting, fishing, hiking, jogging, mountain biking and wildlife viewing. Developed recreational areas include community parks, three shooting ranges, one golf course, and the Carbon County Fairgrounds. The Carbon County trails plan includes several planned trails within the Project Area, located mainly along existing roads and trails.

Most of the federal lands within the Project Area are mapped by BLM as Visual Resource Management (VRM) Class IV, which allows for major modifications to the existing landscape. Class III areas occur along the natural escarpments and ridgelines that surround the Price River Valley, and require that changes be visually subordinate to the existing landscape. Areas considered to be sensitive to visual change include communities, rural residential areas, areas of concentrated or dispersed recreation, and transportation corridors.

Because of the low population density, ambient noise levels are estimated to range from 35 to 40 decibels. Noise levels in more populated or industrialized areas may be somewhat higher.

The economies of Carbon and Emery Counties have experienced considerable swings over the past 15 years, mainly related to changes in the coal mining industry and energy markets. Mining currently comprises 26 percent of employment in Emery County, and 12 percent in Carbon County. State and local revenues from existing CBM developments include state mineral lease royalty payments, state and local share of federal royalty payments, severance tax, conservation tax, ad valorem tax, and sales and use taxes, and totaled over $3.5 million dollars in 1995.

ENVIRONMENTAL CONSEQUENCES

The Proposed Action and alternatives were evaluated for their potential impacts on various environmental, social and cultural resources. Issues analyzed by alternative are addressed in detail in Chapter 4. Some issues had similar impacts for all alternatives and are addressed in Chapter 1. A brief summary of impacts is provided below. In general, the different alternatives all have the same kinds of impacts but the magnitude of impacts varies according to the number of wells and other facilities.

Geology

Recovery of gas reserves would range between 417 billion cubic feet for the No Action to 1,277 billion cubic feet for Alternative A. No adverse impacts are expected for geology.

Water Resources

All of the alternatives would involve some minor short-term impacts to surface water quality as a result of surface disturbances during construction. Longer-term erosion and salt loading for all alternatives are expected to

be within levels observed for existing conditions. Water from the Ferron Sandstone would be relocated, evaporated and/or mixed with poorer quality water as a result of injection under all the alternatives. Finally, the purchasing or leasing of water rights to meet the water needs for any of the alternatives would require a change from current municipal, industrial or agricultural usage.

Air Quality

Construction related activities would cause moderate, short-term, and localized increases in gaseous and particulate emissions (fugitive dust), but are not likely to result in violation of any air quality standards. Operation of the compressor stations would cause minor increases in NO_2 and CO concentrations, but no significant impacts to air quality. A visible plume may be observable in Price under worst-case atmospheric conditions.

Soils

All alternatives would involve disturbance of highly erodible soils, highly saline soils, and areas with material unsuitable for reclamation. Soil loss from erosion would range from 607 to 36,441 tons/year, depending on the alternative and the extent of bare ground, mulched revegetation areas, and successful revegetation. Salt delivery to regional water systems from disturbance and erosion of saline soils would range from 8 to 255 tons/year, again depending on the alternative and ground conditions. Materials unsuitable for reclamation are present in some portions of the Project Area, and alternate source of cover soil material would be necessary to reclaim 76 to 207 acres.

Vegetation

All of the alternatives would involve removal or disturbance of large areas of vegetation; impacts would be scattered around the Project Area, and would range from about 1 percent of the Project Area for the No Action, to 3.1 percent for Alternative A. The Project Area would remain predominantly in natural vegetation. Impacts to pinyon-juniper woodlands would range from 171 to 658 acres and would be long-term. Most loss and disturbance of riparian vegetation would be avoided during facility siting. Revegetation would be difficult in some areas, and would require monitoring and retreatment of failures. Some spread of noxious weeds may occur, but control is required by law and committed to by RGC.

Wetlands

All of the alternatives have the potential to adversely affect wetland area and functions by filling, excavating, clearing and grading, and drainage. Impacts are expected to be low to moderate, because of required permitting and environmental protection measures. The area of potential affect is highest for Alternatives A, B2 and C2, and lowest for the No Action. Most impacts would be avoided during facility siting.

Wildlife

Disturbance and displacement of mule deer and elk on critical and high value winter ranges would have significant impacts for all alternatives. All alternatives are expected to result in regional reductions in winter range carrying capacity and populations, ranging from 8 to 23 percent for mule deer in the North Manti herd unit, and 6 to 11 percent of elk in the Manti herd unit. Corresponding reductions in population goals set by Utah

Division of Wildlife Resources would be 1,200 to 3,220 deer, and 660 to 1,210 elk. Mountain lion would be largely displaced from the Project Area, except where the alternatives provide secure habitat. The project is not expected to adversely affect regional populations of black bear, moose or pronghorn antelope. It would not directly impact sage grouse, but would reduce the potential for re-establishment. Raptors may experience increased stress and disturbance, and 4 to 14 nests would be located within 1/2 mile of facilities. The highest impacts would generally occur from Alternative A. Alternatives B1, B2, C1, C2 and No Action would avoid development in specific areas of high importance to big game and other wildlife.

Special Status Species

All of the alternatives may adversely affect nesting peregrine falcon, but are not likely to have adverse effects on wintering bald eagles or on endangered Colorado River fish. Impacts to sensitive species are expected to be low to negligible on federal land and low to moderate on other lands. Species potentially affected include loggerhead shrike, burrowing owl, ferruginous hawk, and sensitive plants.

Cultural Resources

Direct disturbance or destruction of significant sites could occur under all alternatives. The Project would affect from 998 to 2,109 acres of high sensitivity, and 678 to 1,985 acres of medium sensitivity. Private collection and vandalism could also occur under all alternatives. The area affected would range from 5 to 11.9 percent of the high sensitivity areas, and 2.3 to 11.7 percent of the medium sensitivity areas. Sites of Native American religious or cultural significance may have direct or indirect disturbance. The area affected would range from 3.7 to 11.8 percent of the Project Area.

Land Use

The project would be in conformance with plans and policies for State Trust Lands and with locally adopted plans for Carbon and Emery Counties, but inconsistent with management objectives for the Gordon Creek Wildlife Management Area and the Carbon County Trails Plan. Impacts to incorporated towns and residential subdivisions would be avoided, but impacts would occur to rural dispersed residences from noise, visual, dust and traffic. Moderate increases in traffic would occur on highways and local roads, and there would be increased maintenance costs. Long-term losses of agricultural land would occur, and would range from 107 to 188 acres for the various alternatives. Impacts would be highest for land use under Alternatives A, B2 and C2, and lowest under the No Action alternative, based on the amounts of facilities and the acres affected.

Livestock Management

A loss of grazing capacity would occur on federal allotments, from removal of vegetation during construction, and placement of operational facilities. Loss of AUMs would range from 69 to 277 for construction, and 36 to 174 for operation. Increased traffic may result in greater livestock accidents and harassment, and would be proportional to traffic increases associated with the alternatives.

Recreation

CBM facilities would be placed on public lands west of Price, and would result in a loss of quality for dispersed recreational activities including hiking, jogging, horseback riding,

mountain biking, hunting, and use of planned county trails. Exclusion areas for protection of wildlife in Alternatives B1 and B2 would reduce impacts compared to the Proposed Action and Alternative A. Alternatives C1 and C2 would have smaller reductions in impacts. Under the No Action alternative, public lands west of Price would retain most of the current recreational values.

Visual Resources

All of the alternatives, including the No Action alternative, would substantially change the visual quality of portions of the Project Area, and result in significant visual impacts to rural residences, to public lands used for recreation and to local travel routes. These types of changes are consistent with the BLM's Visual Resource Management objectives for Class IV landscapes, but changes to Class III lands would exceed the level of acceptable visual change when located in foreground/middleground distance zones. Private rural residential lands and recreational areas, estimated as Class II or III, would be significantly affected by reduced qualities in rural natural settings, including 907 to 1836 acres of foreground distance zones. Impacts would be greater for Alternatives A, B2 and C2 because of the increased density of facilities.

Noise

Noise impacts from construction and operation activities would depend on the distance between the noise source and the receptor. Receptor locations greater than about 500 feet from the noise source would not be adversely affected. The increased numbers of facilities under Alternatives A, B2 and C2 would have a greater potential for adverse effect.

Socioeconomics

There would be an increase in employment from the project, with up to 96 to 385 jobs created, depending on the alternative and the stage of development. A seasonal influx due to transient construction workers would occur, but little or no increase in demand for temporary housing or for community facilities and services would occur. There would be a substantial net benefit to state and local government from payment of taxes and royalties. The project would have an adverse effect on citizens who value outdoor recreation, but a beneficial impact on those receiving higher wage employment and economic opportunity. Both positive and negative impacts would be highest for Alternatives A and C2, and lowest for the No Action alternative.

Health and Safety

There is a small potential for leaks, rupture, fire, and explosions from gas flowlines, and a negligible potential for human-caused wildfire ignitions. Health and safety risks associated with well field construction and operation would be similar to those associated with heavy construction and industry, and would not affect the public.

CUMULATIVE IMPACTS

Compliance with NEPA requires that impact analysis consider the cumulative effects of the Proposed Action and each of the alternatives collectively with the impacts of ongoing, other proposed, and potential projects and activities. Ongoing and reasonably foreseeable future actions analyzed for cumulative impacts (together with the alternatives) include the following:

- Five ongoing CBM exploration and development projects located near the Project Area
- One proposed CBM project, overlapping with the Project Area
- Potential additional drilling within the Price CBM Project Area (additional to the alternatives evaluated in Chapter 4). The total number of wells would range from 285 for the additional drilling with the No Action alternative, to 1,100 wells with Alternative A.
- Potential CBM development of the Ferron Fairway
- Potential north-south interconnect gas pipeline
- Proposed and potential coal mines
- New subdivisions near Price
- Future logging
- Water diversions associated with the Gooseberry Narrows Dam

Cumulative effects were evaluated for water resources, air quality, soils, wildlife, recreation, visual resources, and socioeconomics.

Cumulative impacts for water resources could potentially include the loss of flow from springs where the Ferron Sandstone is exposed; significant short-term surface water quality degradation due to CBM construction activities, and potentially reduced surface water flow volumes associated with the proposed Gooseberry Narrows dam project. Cumulative emissions are not likely to exceed air quality standards, but may be an issue during permitting of some compressor stations. Emissions of nitrogen oxides from the compressor stations would contribute to regional haze and reductions in visibility. Construction emissions and fugitive dust would have localized effects and would not be likely to exceed air quality standards. Significant cumulative effects to regional soils are unlikely, because of erosion control and revegetation requirements, and because impacts would be dispersed over a large area and affect only about 3 percent of the total area. There would be significant cumulative impacts to mule deer populations and winter habitat in the North Manti herd unit, and to elk populations and winter habitat in the Manti herd unit. Together with impacts to other herd units from other projects, there may be significant reductions in regional big game populations, habitat carrying capacity, and hunting opportunities. Cumulative developments in open space would reduce the availability and quality of dispersed recreational activities in the region. Cumulative impacts to visual resources would be significant, and would include transformation of existing natural landscapes to an industrial character in foreground and middleground distance zones of residential areas, roadways, and areas of dispersed recreation. The projects evaluated together with the RGC Project would likely have a significant positive impact on employment and tax revenues. However, depending on timing of the various projects, a boom-bust cycle may occur. The quality of life would be degraded for those who strongly value outdoor recreation or existing scenic quality, but may be improved for those directly or indirectly employed by the developments.

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF TABLES (Tables are located at the end of their respective chapters.)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF FIGURES (Figures are located at the end of their respective chapters.)

LIST OF PLATES (Plates are located after the Index.)

ACEC	Areas of Critical Environmental Concern
ACHP	Advisory Council on Historic Preservation
AHPA	Archaeological Historic Preservation Act
AIRFA	American Indian Religious Freedom Act
APD	Application for Permit to Drill
APE	Area of Potential Effects
API	American Petroleum Institute
ARPA	Archaeological Resources Protection Act
ASME	American Society of Mechanical Engineers
ATV	All-terrain vehicle
AUM	Animal Unit Months
BLM	Bureau of Land Management
BMP	Best Management Practices
CAA	Clean Air Act
CBM	Coalbed Methane
CE	Critical Environment
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COE	U.S. Army Corps of Engineers
CRMP	Cultural Resources Management Plan
CV	Contingent Valuation
CW	Critical Winter Habitat
DOT	U.S. Department of Transportation
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPM	Environmental Protection Measures
ESA	Endangered Species Act
FLPMA	Federal Land Policy and Management Act
GRI	Gas Research Institute
GCWMA	Gordon Creek Wildlife Management Area
GRI	Gas Research Institute
HV	High Value Yearlong Habitat
IDT	Interdisciplinary Teams
ISCST3	Industrial Source Complex 3
KOP	Key Observation Point
KWH	Kilowatt Hours
MFP	Management Framework Plan
MMS	Minerals Management Service
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves and Repatriation Act
NAS	National Academy of Sciences

NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NORBA	National Off-Road Bicycle Association
NOS	Notice of Staking
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NSR	New Source Review
O_3	Ozone
OHV	Off-highway Vehicle
OOG	Onshore Oil and Gas
PA	Programmatic Agreement
PCIF	Permanent Community Impact Fund
PILT	Payments in Lieu of Taxes
PLS	pure live seed
PM_{10}	Particulate Matter with an aerodiameter of 10 microns or less
PNC	Potential Natural Community
PRRA	Price River Resources Area
PRWID	Price River Water Improvement District
PSD	Prevention of Significant Deterioration
RFFA	Reasonable foreseeable future actions
RGC	River Gas Corporation
RO	Reverse osmosis
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
ROW	Right-of-Way
RV	Recreational Vehicle
SCS	Soil Conservation Service
SHPO	State Historic Preservation Office
SIA	Significant Impact Area
SITLA	School and Institutional Trust Land Administration
SLT	Standard Lease Terms
SO_2	Sulfur Dioxide
SPCC	Spill Prevention, Control, and Countermeasure
SRMA	Special Recreation Management Area
SRRMP	San Rafael Resource Management Plan
SUPO	Surface Use Plan of Operations
TCU	Transportation, Communication, Utilities
TDS	Total Dissolved Solids
UDNR	Utah Department of Natural Resources
UDOGM	Utah Division of Oil, Gas and Mining
UDWQ	Utah Department of Water Quality

UDWR	Utah Division of Wildlife Resources
UIC	Underground Injection Control
UPDES	Utah Pollutant Discharge Elimination System
UPL	Utah Power and Light
USDI	U.S. Department of the Interior
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VQO	Visual Quality Objectives
VRM	Visual Resource Management
WCC	Woodward-Clyde Consultants

LIST OF MEASUREMENTS

$\mu g/m^3$	micrograms per cubic meter
ac-ft	acre-feet
amsl	above mean sea level
bbl	barrels (1 bbl = 42 gallons)
bcf	billion cubic feet
BWPD	barrels of water per day
cfs	cubic feet per second
dB	decibels
dBA	decibels on A-weighted scale
°F	degrees Fahrenheit
ft/d	feet per day
gpm	gallons per minute
HP	horsepower
L_{dn}	day-night average levels
L_{eq}	equivalent noise level
m/s^2	meters per second squared
Mbtu/h	million British thermal units per hour
Mcf/day	thousand cubic feet per day
mg/L	milligrams per liter
Mgd	million gallons per day
MMcf/day	million cubic feet per day
mmhos/cm	millimhos per centimeter
mph	miles per hour
MW	megawatt
OD	outside diameter
ppm	parts per million
psi	pounds per square inch
psig	pounds per square inch gauge
tcf	trillion cubic feet
yds^3	cubic yards
yrs	years

Chapter 1.0

Chapter 1.0
Tables & Figures

Chapter 2.0

Chapter 2.0
Tables

Chapter 2.0
Figures

1.1 PROPOSED PROJECT

River Gas Corporation (RGC) has notified the Bureau of Land Management (BLM), the Price River/San Rafael Resource Area, of the company's intent to develop a coalbed methane (CBM) gas production field in an area adjacent to the City of Price, Utah. The proposed project, Price CBM Project, would involve the construction (wellpads), drilling, and completion/stimulation of 601 CBM gas wells and associated access roads, pipelines, and electrical distribution lines over approximately a 10-year plus period within an approximately 290-square mile Project Area (Figure 1.1-1). The proposed Project Area occupies portions of Carbon and Emery counties and contains the City of Price and the communities of Carbonville and Spring Glen and portions of Helper, Wellington, Wattis, and Hiawatha.

1.2 PURPOSE AND NEED

RGC has given notice to the U.S. Department of the Interior (USDI), BLM of its intent to expand current CBM field development activities, located principally on state and private lands, onto federal lands in the Project Area. RGC holds valid federal, state, and private oil and gas leases within the Project Area. The leases have created contractual and property rights for RGC from the United States, the State of Utah and private mineral landowners to develop the CBM gas resources. The purpose of RGC's Proposed Action is to remove recoverable CBM gas at a profit within the portion of the Project Area that is or would be leased by RGC. Gas currently being produced by RGC flows from the Project Area to the Provo/Salt Lake corridor. The gas is transported by Questar Pipeline Company. RGC plans to continue using the Questar pipeline system to transport gas to market.

Private exploration and development of federal oil and gas leases is an integral part of the BLM's oil and gas leasing programs under authority of the Mineral Leasing Act of 1920, as amended by the Federal Land Policy and Management Act of 1976 and the Federal Onshore Oil and Gas Leasing Reform Act of 1987. The BLM oil and gas leasing program encourages development of domestic oil and gas reserves and the reduction of U.S. dependence on foreign energy sources. Natural gas, including CBM gas, is considered essential to supplying the nation's future energy needs. Domestic demand for natural gas is increasing and is expected to reach 24.8 trillion cubic feet (tcf) per year in 2010 (GRI 1993). To satisfy federal energy policy, increased development of domestic natural gas is necessary.

The proposed Price CBM project would provide the opportunity to develop a domestic energy source that may help lower dependence on foreign sources. The project would also provide a clean-burning energy resource that could supplement or replace some existing energy sources that are more harmful to the environment.

1.3 ENVIRONMENTAL ANALYSIS PROCESS

The BLM is required by the National Environmental Policy Act (NEPA) and Council on Environmental Quality (CEQ) directives to analyze proposed actions involving federal lands and leases in terms of their potential impact on the human environment (40 CFR Parts 1500-1508). The BLM is further required, by the regulations implementing the Mineral Leasing Act of 1920, to review and act on

Applications for Permit to Drill (APDs) and attached Surface Use Plan of Operations (SUPO), and to decide on the requirements for surface occupancy provided by the SUPO.

The BLM also issues right-of-ways (ROW, i.e., permission to construct and operate linear transportation facilities such as roads and pipelines) across federal lands under Title IV of the Federal Land Policy and Management Act (FLPMA). The analysis of impacts to the human environment discloses the potential environmental consequences of the Proposed Action and alternative actions. Another BLM responsibility is establishing provisions for ensuring the reclamation of facilities and disturbed lands should an oil and gas operator fail to complete adequate reclamation efforts. Bonds are required for oil and gas operations on federal leases to protect the environment. Refer to Section 1.6.2 for a discussion of bonding adequacy.

The BLM, Moab District, Moab, Utah is the responsible federal agency for preparing this Environmental Impact Statement (EIS). The development of this proposal and the alternatives was conducted through a cooperative effort among RGC, the BLM, and the project interdisciplinary team. Interdisciplinary participation included specialists provided by a third-party contractor, a private consulting firm working under the direction of, and in cooperation with, the BLM.

The EIS provides the responsible agencies with information upon which to base a final decision that is fully informed and that considers all factors relevant to the proposal. Scoping issues and concerns raised by the public drive the development of alternatives and the impact analysis process. The EIS serves to document (1) the analysis of impacts that result from implementation of the proposal and alternatives and (2) the development of environmental protection measures necessary to reduce or eliminate environmental consequences.

Factors considered during the environmental analysis process for this proposed CBM gas field development and gas production project include the following:

- The location of wellsites, access roads, pipelines, electrical distribution lines, compressor facilities, and produced water disposal facilities reflects an initial attempt to minimize surface resource impacts and to meet needs of other resource activities while honoring the lease rights within the Project Area.
- The determination of impacts, which are anticipated to result from implementation of the Proposed Action and alternatives, is made in accordance with applicable regulations and lease stipulations, and with the application of mitigation measures necessary to avoid or minimize these impacts.

The EIS is not a decision document; it documents the process used to analyze the potential environmental consequences of implementing the proposed CBM gas field development project and alternatives to the Proposed Action. The decision regarding the proposed project will be documented in a Record of Decision (ROD) signed by the responsible BLM official. The BLM decision will relate primarily to federal lands administered by the BLM. Decisions by other jurisdictions to issue or not to issue approvals related to this proposal may be aided by the disclosure of impacts available in this analysis.

The EIS is not the final review upon which approval of all actions in the Project Area will

be based. Site-specific environmental analyses and additional NEPA compliance documentation will be required for all site-specific actions. The scope of this additional approval process will be greatly reduced if significant changes in location of facilities or activities evaluated in the EIS are not required.

1.3.1 Preferred Alternative Identification

Identification of a preferred alternative is required in a Draft EIS to allow the public to review the agencies' preference. The preferred alternative may be changed in the Final EIS based upon comments received on this draft. Rationale for the selection of a preferred alternative will be provided in the ROD.

Alternative C1 - Security Areas Protection, 160-acre well spacing has been identified as the BLM's preferred alternative. A description of this alternative is provided in Chapter 2, Section 2.5.1.

1.4 LAND STATUS, LEGAL, AND POLICY CONSIDERATIONS

1.4.1 Land Status

Acreage of the Project Area totals approximately 188,242 acres. Surface and mineral estate ownership within the Project Area is divided among federal (BLM administered), School and Institutional Trust Lands Administration (State), Utah Division of Wildlife Resources (UDWR), and private entities (Plate 1). BLM-administered federal surface lands account for approximately 82,741 acres (44 percent of the Project Area); state surface lands total 44,866 acres (24 percent); and the remaining 60,635 acres (32 percent) are held in private ownership. Mineral ownership within the Project Area is split roughly equally between federal (95,462 acres) and state/private (92,780 acres) ownership. Lands with federal mineral ownership and non-federal surface ownership are called "split-estate", and occupy about five percent of the Project Area. These lands are included in BLM's permitting, environmental review, and environmental protection responsibilities.

RGC currently holds leases on approximately 123,000 acres on federal, state, and private lands within the Project Area (approximately 65 percent of the Project Area). Federal surface/mineral and non-federal surface/federal mineral lands not currently leased by RGC within the Project Area are either leased by other firms or individuals, or are not leased for oil and gas development. Nearly all federal lands within the Project Area are currently leased for oil and gas; or oil, gas and coal exploration and development.

On state and private lands within the Project Area, RGC has drilled in 1995 98 wells (89 producing wells, 8 coreholes and one injection well), with approximately 58 miles of access road, pipelines, and electrical distribution lines, constructed single compressor and injection well facilities. Additional details regarding existing RGC development are presented in the description of the Proposed Action, Chapter 2. The existing development is integral to the Proposed Action and alternatives as each is connected to and is an expansion of the existing development.

1.4.2 Lease Categories

In 1973, the U.S. Department of Interior published an EIS on the Federal Upland Oil and Gas Leasing Program. The proposed action was to lease federal lands for production of oil and gas resources. Alternatives included the "no action" alternative. To make specific environmental analysis in Utah and to supplement that impact statement and environmental analysis, the BLM, in Utah,

produced a series of Environmental Assessments (EA) for each district in 1974-1975.

As a result of that analysis which involved months of public participation from all interested parties, a category system for leasing was developed. Under the system, all public and Forest Service lands were categorized into four leasing categories:

Category 1 - Open Lease Areas - with standard "open ended" lease stipulations.

Category 2 - Open Lease Areas Subject to Special Stipulations - with specific stipulations attached to the lease for special concerns (e.g., critical deer winter range).

Category 3 - Open Lease Areas Subject to No Surface Occupancy - where other resource values were intolerant of surface disturbance, thus requiring petroleum development through directional drilling.

Category 4 - Suspended or No Lease Areas - in which the highly critical nature of the other resource values outweigh the value of oil and gas resources that cannot be extracted through directional drilling other than in exceptional instances.

The BLM has been issuing leases under this system since 1975. The analysis completed in the EA assumed that any areas leased under Category 1 or 2 could go to full field development provided that a site-specific EIS be completed for the actual proposals.

Limitations on types, duration, and location of activities generally increase in order of ascending category number. Specific discussions of each category are presented in **Appendix 1A**.

Leases on federal mineral estate have been granted within the Project Area to RGC and others. Special stipulations attached to federal leases in the Project Area are listed by category in **Appendix 1B**. The extent of leased areas within the Project Area with these attached special stipulations is mapped and also presented in **Appendix 1B**.

1.4.3 Conformance with Management Framework Plan

The Proposed Action and all alternatives described in this EIS would take place within the Price River Resource Area and the San Rafael Resource Area of the BLM. The Price River Resource Area is managed under a Management Framework Plan (MFP) (USDI, BLM 1984a), a MFP Supplement (USDI, BLM 1984b), and the subsequent Environmental Assessment Supplement (USDI, BLM 1988a) approved in 1983. The San Rafael Resource Area is managed under a Resource Management Plan (RMP) approved in 1991.

The decision in the Price MFP pertaining to oil and gas development states: "Establish oil/gas production as the priority land use for Known Geologic Structures which have been or may be identified". The San Rafael RMP decision states: "Management Objective is to

lease public lands for oil and gas development, and to allow geophysical activity to occur, only so long as the RMP goals are met; and to administer operational aspects of federal oil and gas leases where BLM does not manage the surface".

The Proposed Action and all alternatives analyzed in the EIS have been determined to be in conformance with both land use plans, and a plan amendment would not be required.

1.5 AUTHORIZING ACTIONS

Federal, state, county, and local authorizing (permitting) actions required to implement any of the alternatives would generally be the same regardless of the alternative selected. These actions are listed in Table 1.5-1.

1.6 PUBLIC INVOLVEMENT/ SCOPING OF ISSUES AND ALTERNATIVES

Public issues and comments regarding the Price CBM Project were solicited for incorporation into this EIS through the scoping process. Specifics regarding the scoping process for this analysis are discussed in Chapter 6 of this EIS. The Public Scoping Summary Report that described the actions to be analyzed was prepared and submitted to the public on January 30, 1995. The Summary Report identified preliminary land and resource management issues, concerns, and opportunities, and outlined timing needs for public involvement. Environmental and social issues of local importance associated with CBM (natural gas) production were identified.

In addition, the BLM (USDI, BLM 1988b) requires that potential impacts be addressed for the following twelve critical elements:

- Water Quality
- Floodplains
- Air Quality
- Farmlands, Prime/Unique
- Threatened and Endangered Species
- Wetlands/Riparian Zones
- Areas of Critical Environmental Concern (ACECs)
- Wild and Scenic Rivers
- Wilderness Areas
- Native American Relations Concerns
- Cultural Resources
- Wastes, Hazardous/Solid

Issues analyzed in this EIS are listed by resource in Section 1.6.1. Issues considered, but not analyzed by alternative are listed in Section 1.6.2.

1.6.1 Issues Analyzed

Project Description Issues

- Assurances for effective reclamation and revegetation of disturbed areas
- Responsibility for road/bridge improvements and maintenance
- Effect of handling and disposal of wastes, including hazardous materials

Physical Resources Issues

Geology

- Effect of irretrievable commitment of coalbed methane

Water Resources

- Effect of construction activities, and subsequent increased runoff and sedimentation on surface water quality

- Effect of erosion of saline soils on the quality of the Price River and other surface waterbodies
- Effect of production and operation activities, including accidental spills, on surface water quality
- Effect of road and pipeline crossings on perennial and intermittent streams
- Effect of groundwater withdrawal from the Ferron Sandstone
- Effect of disposal of produced water on groundwater quality
- Effect of water consumption by the project activities on the needs of the communities

Air Quality

- Effect of construction activities, including emissions from equipment and fugitive dust
- Effect of gaseous emissions from operating gas-fired compressors and glycol dehydration units at compressor facilities
- Effect on visibility, both locally and regionally
- Cumulative effect from other energy development activities in the region that already reduce visibility and increase air pollution

Soils

- Effect of increased wind and water erosion of soils in disturbed areas exposed for extended periods of time during construction, especially on steep terrain
- Effect of increased volumes of runoff on areas prone to gully development; particularly formation of deeply incised gullies that can restrict access to valleys and ranges in the Mancos Shale region
- Effect of soil loss and increased sediment and salt loads on surface water due to increased erosion
- Effect of unsuccessful reclamation

Biological Resources Issues

Vegetation

- Loss of vegetation, particularly the clear cutting of trees, and the resulting effect on visual scenery, wildlife habitat, livestock management and soil erosion control
- Noxious weed control/management
- Success rates for reclamation and mitigation measures, based on problems with past projects
- Development and implementation of a strong compliance and monitoring plan

Wetlands/Riparian

- Losses of wetland and of riparian areas during construction and operation

Wildlife

- Loss of high value and critical winter range for big game (mule deer, elk,

moose, antelope) from surface disturbance associated with CBM development

- Loss of habitat suitability and value from disturbance and displacement of big game
- Effect of CBM development and associated habitat impacts on big game populations in the project area
- Development of effective mitigation to retain as many of the wildlife resource value in the project as possible and to replace or compensate for affected wildlife resource values
- Effect on black bear and mountain lion populations and habitat
- Effect on sage grouse habitat and breeding activity
- Effect on prairie dog habitat and population and on species associated with them
- Effect on nesting birds
- Effect of noise, dust, and traffic on reduction of wildlife

Special Status Species

- Effect on federally listed threatened and endangered plants and animals, including Colorado River fish, wintering bald eagle
- Effect on other sensitive species, including spotted bat, loggerhead shrike and burrowing owls

Human Resources Issues

Cultural Resources

- Effect of ground-disturbing activities and indirect impacts on cultural resources, including archaeological sites
- Effect of any project activities on Native American sites with religious or cultural significance

Land Use

- Potential for nonconformity with adopted plans and policies of federal, state, and local agencies
- Effect of CBM development on existing land uses, including irrigated agriculture
- Potential land use incompatibility between project facilities and operations and residential, recreational, and other community uses
- Effect of project-related traffic on local roads used by the public

Livestock Management

- Effect of disturbance of vegetation on livestock carrying capacity
- Effect of vehicular traffic from the general public; and the construction and maintenance of roads, wellpads, and other facilities on livestock management
- Effect on livestock management facilities

Recreation

- Effect of CBM development on loss or disturbance of recreational opportunities, particularly associated with the "de facto" trail system around the Price and Helper area (above Kenilworth and the Woodhill area), including picnicking, hiking, jogging, horseback riding, motorized off-road vehicle, mountain biking, and cross-country skiing

Visual Resources

- Effect on scenic quality from construction activities, and the long-term presence of project facilities, including the loss of natural vegetation and grading of landforms for roads and facilities

- Effect of project facilities on visibility from communities, public roadways and recreation areas

- Effect of night lighting of CBM facilities on dark skies

- Effect of project construction and operation resulting in increased air pollutants that may increase regional haze and diminish visibility to distant mountains and ridges. (Refer to Section 4.3 on air quality impacts.)

Noise

- Effect of project activities, including construction, drilling, operation of compressor stations and pumps, and vehicular traffic on ambient noise levels

Socioeconomics/Quality of Life

- Effect of CBM development on employment - number, types and longevity of jobs to be created, hiring of local workers

- Costs and benefits of the proposed project

- Effect of a possible economic boom-bust cycle

- Applicant support of local communities through charities and community events

- Effect of CBM development on quality of life

Health and Safety

- Effect of increased human use of lands on wildfire ignitions

- Effect of potential natural (CBM) gas flowline leakage, rupture, and possible fire and/or explosion

- Risks associated with well field construction and operations

1.6.2 Issues Considered, But Not Analyzed By Alternative

Several issues raised during scoping or issues that the BLM is required to address were considered but not analyzed in detail. These issues are listed below, along with explanations as to why they were not further analyzed.

Of the twelve critical elements required by the BLM to be addressed, the following elements are not present in the Project Area. An impact

analysis is, therefore, not applicable for the Proposed Action or any of the alternatives.

- Areas of Critical Environmental Concern (ACECs)
- Prime or unique farmlands
- Wild and scenic rivers
- Wilderness areas

Issues required to be addressed that are not relevant to the Proposed Project or alternatives are as follows:

- Native American trust rights, per the Secretary of Interior directive (Babbit 1994) and Executive Order 12898 - no direct or indirect effects are expected from this project because no such rights have been identified in the Project Area.

- Social (environmental) justice policy (Babbit 1994) - no negative direct or indirect effects are expected to low income or minority populations because no such populations exist in close proximity to the Project Area.

Issues raised during public scoping and through the NEPA process that are not analyzed by alternative are listed by resource.

Project Description Issues

- **Bonding Adequacy**

Bonds are required for oil and gas operations on federal leases by Title 43 Code of Federal Regulations Parts 3104.1 and 3162.3 to protect the environment, including historic, natural and cultural resources; to ensure downhole plugging and surface reclamation following drilling or other exploration or development; and to cover unpaid federal royalty obligations. RGC has filed a $25,000 statewide bond with the BLM for operations on federal leases in Utah. The cost to properly plug and reclaim the surface associated with a single well is estimated, in 1996 dollars, at $15,000. All 601 wells of the Proposed Action would then account for a total potential liability of $9,015,000, in 1996 dollars. In the near term and for the vast majority of this project's life, all of those wells which are capable of production in paying quantities are not considered a liability. Additionally, RGC has responded in good faith on all performance requests and has maintained all royalty and rental accounts in good standing. On this basis, the apparent disparity between the bond amount and the potential liability of full implementation of the Proposed Action does not pose a significant risk to the federal government in the foreseeable future. In the waning years of this project, as wells become depleted, liabilities could increase. The BLM may choose to increase the bond to address these future concerns.

Physical Resource Issues

Geology

- **Collection of Geologic Data**

A concern was raised regarding the collection of geologic data associated with coal seams encountered during drilling. Every well drilled as part of the Proposed Action would be logged to record the characteristics of each geologic formation. The drilling logs would be submitted to the BLM and the State of Utah and would be accessible to the public.

- **Future Exploration and Development of Other Mineral Resources**

There is a concern that CBM production and associated activities may preclude future exploration and development of other mineral

resources. The production of CBM would not affect the recovery of oil within the Project Area. Associated with the production of CBM, the coal in the immediate vicinity of the well would be hydrofractured in order to stimulate and enhance well production. Studies involving the stimulation and production of methane from coal seams that were later mined indicate that hydrofracturing does not cause roof falls or adverse mining conditions (Diamond 1987, Dixon 1987). The presence of plugged and abandoned production wells, left after CBM production would have at least one negative impact. The cased hole has the potential of damaging mining equipment, i.e., continuous miners and longwalls. However, there are no known plans to mine the coal in the Project Area with these techniques.

Removal of methane from the coal strata would also not result in any negative impact to the future mining of that coal should it prove economical to do so at a later date. Methane encountered by coal mines is often a dangerous and expensive problem. Studies have shown that CBM production significantly reduces the amount of methane encountered during mining (Dixon 1987). In Alabama, mines have mined through zones that have had previous CBM production. That CBM operation had also hydrofractured the reservoir to stimulate removal of groundwater and to lower reservoir pressures, and produce CBM, just as is proposed for this project. The mine reported substantially less methane and reported no stability problems, even when visible evidence of the previous fracturing was observed in the mine (Diamond 1987). No significant detrimental impact to any future coal mining activities is expected.

- **Geologic Hazards**

Potential geologic hazards within the Project Area include methane gas seepage, subsidence, seismic activity, slope instability, abnormal high pressure, and hydrogen sulfide releases. These issues were analyzed and considered to be not significant relative to the Project Area and proposed activities as described below.

Methane Gas Seepage. In 1995, the United States Geological Survey (USGS), under the direction of UDOGM, conducted a study of the pre- and early development of methane concentrations in groundwater and soil gas within the Project Area. Water tests were conducted at 14 springs in the vicinity. Existing methane production has not affected springs by increasing methane concentrations and no impacts are expected.

Soil gas analysis was conducted at existing RGC wells drilled on state leases. Baseline methane concentration in groundwater averaged less than 0.005 mg/l. The median methane concentration in soil gas samples was less than 0.005 mg/l. Soil gas concentrations decreased significantly within 50 feet from the well bore (Naftz 1996).

Wells drilled in the area would be cased and cemented from the surface through the Ferron Sandstone and by design would prevent methane seeps to surface soils. Concentrations of methane measured near the wells by USGS are thought to be a result of installation. UDOGM has funded an additional study to detect if soils and groundwater are being affected by methane (Hunt 1996).

A concern has been raised about methane seeps at surface outcrops of the Ferron Sandstone. Coalbed methane development in other areas has been suggested to have

resulted in gas migration updip toward an outcrop after dewatering has reduced pressures and increased the amount of free gas held within and flowing through the coal fracture system. Although the Ferron Sandstone outcrop is located updip from the Project Area, there are no known methane seeps at the outcrop. Methane seeps at surface outcrops of the Ferron Sandstone are not anticipated in the future, due to the absence of coal at the outcrop east of the Project Area. The coal seams pinch out approximately five miles west of the outcrop, near Wellington. Here the Ferron Sandstone is estimated to be 500 feet deep, with an overburden consisting mostly of impermeable shale. While the Farnham Unit, approximately 30 feet of porous sandstone, occurs at the Ferron outcrop, this unit is distinct from the methane producing horizon, in a small locale several miles wide.

Subsidence. Although subsidence has occurred as a result of water production in some areas of the country, subsidence from groundwater withdrawal associated with this project is unlikely because the production zone is quite deep and the geologic units are not very compressible (Tabet 1995b). The Utah Geological Survey does not consider subsidence a significant concern within the Project Area (Tabet 1995b).

Seismic Activity. Seismic activity, i.e., earthquakes, in the area may adversely affect the CBM operation and may cause damage to surface facilities, pipelines and wells. However, the potential for the proposed project to affect seismic activity in the area is minimal, as is the potential for seismic activity to affect the project.

The normal fault systems of the Wasatch Plateau and the thrust faults southeast of the Project Area provide some evidence of seismic activity in the vicinity of the Project Area. The North Gordon fault system is considered "geologically active"; however, it is not considered significant compared to the seismic activity initiated by local coal mines (University of Utah Seismic Station 1995). The thrust faults southeast of the Project Area are considered inactive because: (1) the lack of information about them, both in the literature and in the seismic record at the University of Utah, implied there has been no recent activity; (2) these faults originated in either the Sevier or Laramide Orogenies. The younger of these two mountain building events and the most likely to have created the thrust faults in question is the Laramide Orogeny which began 50 to 60 million years ago and continued for 25 to 30 million years. Since Laramide times, stress regimes that drive faulting, have changed. Extensional stresses, which result in the high angle normal faulting common to the basin and range just west of the Project Area, make moving along compressional, thrust faults very unlikely.

Most of the seismic activity in the vicinity of the Project Area is generated by coal mining activity (University of Utah Seismic Station 1995; UGS 1995). Longwall mining, a mining technique used in some of the Price area coal mines, involves the complete removal of large blocks of coal (much larger than in other mining techniques) leaving nothing to support the overlying rocks. As mining progresses, the overlying rocks are allowed to collapse behind the active mine face thus generating earthquakes. Earthquakes of magnitudes between 2 and 4 on the Richter Scale have been attributed to longwall mining (University of Utah Seismic Station 1995).

Maps of seismic risk for the United States indicate this portion of Utah is at relatively low seismic risk (Keller 1982). Relatively minor earthquakes of up to magnitude 4 on

the Richter Scale have been recorded in the vicinity of the proposed project. The earthquake intensity that is usually associated with a magnitude 4 earthquake is II to III on the modified Mercalli scale. According to this scale, intensity III earthquakes are "felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration like the passing of a truck" (Keller 1982). Earthquakes of this minor intensity are not likely to affect the integrity of wells, pipelines, or other surface facilities, or affect slope stability.

Slope Instability. No specific areas of slope instability or failure have been identified in the Project Area; however, the potential for instability typically exists for most areas where slopes are greater than 30 percent. Such steep slopes do occur in the Project Area. The project activities should have minimal effect on slope stability. Surface disturbance on slopes in excess of 30 percent would be avoided where possible. Where such disturbance cannot be avoided, BLM-required environmental protection measures would be implemented to reduce erosion and protect watershed values. Construction activities on slopes in excess of 30 percent may be specifically authorized by the BLM at the APD stage. Section 3.4 provides additional discussions of slope instability and soil erosion.

Abnormal High Pressure (Blowouts). Encountering high pressures while drilling is always a possibility. However, offset well information can be utilized to anticipate subsurface pressures. Nearly 100 CBM wells have been drilled in the Project Area without experiencing abnormally high pressure. One well outside the Project Area encountered abnormally high formation pressure, but that situation was safely and effectively controlled by the approved blowout preventer.

Because it is impossible to know exactly what pressures will be encountered, all wells drilled are required to have Blowout Prevention Equipment (BOPE) that will safely control any abnormal pressures encountered. Onshore Oil and Gas Order No. 2 (Drilling Operations) establishes the minimum equipment necessary to safely drill and handle specific pressure situations. All wells drilled on Federal mineral estate will adhere to this Order. Wells drilled on fee and state-owned minerals have similar requirements administered by UDOGM. Pressure equipment is prescribed on a site-specific basis during APD approval. In addition, all RGC drilling crews are certified with blowout prevention training.

Hydrogen Sulfide Releases. Hydrogen sulfide (H_2S) has not been encountered while drilling any of the approximately 140 CBM wells drilled to date into the coal zones of the Ferron Sandstone and Blackhawk Formation within and surrounding the Project Area. Encountering H_2S is a distinct possibility while drilling the deeper injection wells through the Navajo Sandstone. There also exists the possibility that H_2S will be generated at the injection facilities. Operations involving H_2S on federal leases are regulated by Onshore Oil and Gas Order No. 6 (Hydrogen Sulfide Operations). This Order requires, on a site-specific drilling well or production facility basis, monitoring of H_2S beginning at levels of 10 parts per million (ppm). Should H_2S levels increase, additional drilling and production equipment along with a Drilling Plan and Public Protection Plans will be required.

- **Paleontological Resources**

Paleontological resources occur within the Price River Resource Area in the Carmel Formation, the Summerville Formation and members of the Mancos Shale (USDI, BLM 1992). Marine fossils likely to be found in the Project Area include, in order of decreasing abundance: mollusks, protozoans, arthropods, worms, brachiopods, bryozoans, echinoderms, coelenterates, and sponges. The most common fossils found in the region are pelecypods which can be found in great banks containing millions of shells at certain stratigraphic levels. Gastropods are the next most plentiful fossil in the region. Shark's teeth are easily found in certain members of the Mancos Shale (Stokes 1988). The Cretaceous rocks yield a notable record of both continental and marine vertebrates. Although the Cleveland-Lloyd Dinosaur Quarry is located approximately eight miles southeast of the Project Area near Cleveland, Utah, no major dinosaur finds have been recorded in the Project Area. The Cleveland-Lloyd Dinosaur Quarry is located in the Morrison Formation which is not exposed within the Project Area. There is a low probability for a significant paleontological find in the Project Area. It is not considered a collecting site and no paleontological inventory is required at this time by the BLM. (Rasmussen 1996).

Water Resources

- **Potential for Community Use of Produced Water**

The proposed CBM Project would produce a maximum of approximately 107,000 BWPD (13.8 ac-ft/day) that with treatment could be used for community use including municipal, industrial and irrigation use. Because Carbon County is dependent on limited supplies of water, any source of water would be important to local water users. Projected annual water production from the Proposed Action would be equivalent to approximately six percent of the annual community water use in Carbon County as reported in the 1995 Price River water commissioners' reports. However, the County or RGC would have to apply to the State of Utah for rights to the produced water for community water uses. Because Carbon County has not applied for water rights or approached RGC or BLM with a proposal for use of the potential water source, the potential for community use of the produced water is not analyzed further in this EIS. An application for use of the public lands for water treatment facilities for treatment of CBM produced water for community use would be a separate project and would require additional NEPA documentation.

- **Water Rights Owned By RGC**

RGC has entered into an agreement with PRWID and other local users to purchase or lease fresh water. The water to be used for the project would come from the Price River and Scofield Reservoir. Based on discussions with the Utah Division of Water Rights and the Price River Water Users Association, all of the water is appropriated by existing water rights. Water purchased or leased by the project would not result in a further depletion or adverse impact on the Price River or Scofield Reservoir (Page 1996). However, the water would shift from municipal, industrial or agricultural use to the CBM project. The Utah Department of Natural Resources, Water Rights Division regulates the diversion and use of water in the state of Utah. The Division of Water Rights will evaluate on a case-by-case basis whether or not RGC must file a change of use application based on the prior consumptive use (Page 1996).

RGC has filed for water rights on water produced from 84 existing wells, but does not intend to file for any additional wells.

- **Floodplains**

The Price CBM Project Area includes several streams and washes that can experience flooding during storm events and/or periods of unusually high runoff. The Federal Emergency Management Agency (FEMA) has identified the portions of these streams and washes that are prone to flooding on its Flood Insurance Rate Maps. Of particular interest are areas designated by FEMA as 100-year floodplains. Streams and washes in the project area that have designated 100-year floodplains include the Price River, Gordon Creek, Spring Glen Wash, Pinnacle Creek, Mead Wash, Cardinal Wash, Drunkards Wash, Deadman Creek, Hayes Wash, Coal Creek, Miller Creek, and Marshing Wash (Plate 11).

The Executive Order 11988 on Floodplain Management states that, as a matter of policy, the federal government should avoid or minimize the adverse impacts associated with floodplain occupancy and modification. The Executive Order directs the federal government to avoid support of floodplain development in order to reduce the risk of flood loss and protect and restore the beneficial values served by floodplains. The Executive Order also directs the CEQ to integrate its floodplain management objectives into implementation of the NEPA. As a result, an EIS must include an assessment of whether the project under review would adversely impact floodplains.

With respect to the proposed project, the BLM has established environmental protection measures that prohibit occupancy or surface disturbance within 100-year floodplains of perennial streams, except where authorized in writing. (Refer to BLM4 in Chapter 2.0, Section 2.2.5.2.) An example of a project activity that may be allowed in a floodplain area under BLM4 would be the construction of road and pipeline crossings. This environmental protection measure would assure that no construction of CBM wells or other structural facilities would occur within 100-year floodplains of perennial streams, thereby minimizing the risk of flood-related damage and losses to property. In addition, no project facilities or activities for any of the alternatives, other than transportation corridor crossings, would be located within 100-year floodplains of intermittent streams. As a result, the Proposed Action, as well as the project alternatives being considered, would be in compliance with Executive Order 11988.

- **Surface Springs**

A concern was raised regarding the potential effect of the CBM development on springs located within the Project Area. A potential impact related to water withdrawals and associated drawdowns in the Ferron Sandstone would be the reduction of flow from any springs that are in hydraulic communication with the Ferron Sandstone. Within the Project Area, there are approximately 90 identified springs (Plate 11). In the northwest corner of the Project Area there are as many as 22 springs that are in the vicinity of a series of high angle normal faults. Little is known about how deep-seated these faults are, but the presence of clay and shale layers within the Mancos Shale makes it unlikely that the faults provide any type of conduit between the Ferron Sandstone and the surface.

Most springs are found in the Star Point Sandstone or younger formations (Waddell 1981), located at the base of the cliffs west of the Project Area. The source of these springs

is the Wasatch Plateau further west. The Star Point Sandstone overlies the Mancos Shale, with a minimum of 4,000 feet of mostly impermeable shale between the springs and the CBM producing interval.

Under the Proposed Action there are about 29 proposed wells within one mile of these springs. There are no known permeable structures connecting the Ferron Sandstone and the springs, or the Ferron Sandstone and the sandstone overlying the Mancos Shale. Any impact to the springs associated with withdrawal of water from the Ferron Sandstone would only occur if hydraulic communication resulted around the annulus of production or injection wells that penetrates both the formations. RGC production and injection wells will be cemented from the surface to the bottom and perforated only in the production or injection zone in accordance with 43 CFR 3160 and Onshore Oil and Gas Order No. 2. Thus, there is little potential that any communication between the Ferron Sandstone and the springs would occur. The Utah Division of Water Rights regulates the use of water in the state to determine if any reduction in water flows would occur and have to be replaced by RGC. Any monitoring of the springs would be dictated by the state.

Air Quality

- **Venting Methane**

There would be minimal venting of gas at wellsites during completion and/or well connection to flowlines. Slight amounts of gas may be produced when the well is flowed to the surface following hydraulic fracturing. The venting would occur only during the recovery of the water and last for a matter of days. Any gas venting would be in accordance with Notice of Lessee 4A. This minimal and infrequent venting of methane is not expected to adversely affect air quality in the Project Area.

Recreation

- **Effect of Water Consumption by the Proposed Project on Recreational Opportunities Along the Price River**

Concern was raised during public scoping on the issue of water use by the Proposed Action and its potential effects on recreational opportunities along the Price River, and effects on any existing wild and scenic qualities of the river. RGC plans to buy available water rights as needed for project development. Water is being purchased from PRWID and withdrawn from the Carbon Canal, one of the main diversion on the Price River, located just north of the City of Price, Utah. All of the available water in the Price River and the Carbon Canal is allocated and currently being used for some purpose, typically agricultural or industrial use. The Price CBM Project may result in a change in ownership and use of existing water in the canal, but should not result in a net change in the amount of water being taken out of the Price River or in the amount of water returned to the Price River through Carbon Canal. Therefore, it is not anticipated that the project would result in changes to water levels in the Price River, and would not affect the existing recreational opportunities along the river, or the existing scenic, recreational, fish, and wildlife, or other wild and scenic river characteristics that the river may possess.

- **Effect on Carbon County Fairgrounds, Rifle Ranges, and Nationally Sanctioned Mountain Bike Race**

Direct impacts to several developed recreational areas may occur, including the Carbon County Fairgrounds, the Four-Mile

Rifle Range and the Pinnacle Peak Black Powder Range. The Carbon County Fairgrounds would continue to incur direct impacts resulting from trucks using the Fairgrounds Road as access to the Project Area. Impacts to the quality of recreational experiences at the fairgrounds would result from the presence of truck traffic and adjacent wells and related noise, traffic, and visual change. Recommended mitigation includes working with the county consultant who is currently revising the fairgrounds master plan to identify any measures, such as landscape screening, that would be effective in reducing the direct impacts of truck traffic on the fairgrounds.

The Four-Mile Rifle Range and Pinnacle Peak Black Powder Range would also be adjacent to CBM roads and/or wells. Individuals using these rifle ranges are not considered to be sensitive to the noise, visual, and dust impacts; however, the Four-Mile Rifle Range may be incompatible with CBM activities due to the potential for stray bullets and related safety considerations. Recommended mitigation includes coordinating with the county to identify measures that would be effective in reducing safety risks near the Four-Mile Rifle Range. Alternative sites for the range should be considered of safety at the existing site cannot be assured.

The Butch Cassidy Bike Race is located northeast of Price, outside of the Project Area. No direct or indirect impacts are expected from the Proposed Action or alternatives.

- **Access in the Project Area on Public Lands**

Access will not be restricted to public lands affected by CBM development, except in select areas where seasonal closure gates will restrict access during the winter months (December 1 to April 1), to protect wintering big game. Some of these areas affected by seasonal closure, such as Pinnacle Bench, Horse Bench, and some areas accessed from the Consumers Wash Road, are important to recreationists, and impacts my be significant during the four-month closure period. Use of these areas is generally not as great during the winter as in other times of the year. The location and geographic area covered by the seasonal closure gates will not change by alternative; however, the miles of road affected by the closure will vary by alternative. Recommended mitigation includes coordinating with the counties and special interest groups to identify any previously closed roads that could be reopened to provide increased access to public lands with recreational values.

Since the vast majority of project-related roads on state and federal lands would have no restrictions to public access, there is the potential that impacts associated with increased access and human disturbance (vandalism, littering, discharging of firearms) would occur in the CBM development area.

1.6.3 Alternatives

1.6.3.1 Alternatives Analyzed

The following seven alternatives were analyzed in detail:

- Proposed Action - field development at 160-acre well spacing
- Alternative A - field development at 80-acre well spacing
- Alternative B1 - Critical areas avoidance - field development at 160-acre well spacing; precluding well drilling on federal mineral estate within boundaries of critical deer and elk winter range
- Alternative B2 - Critical areas avoidance - field development at 80-acre well spacing; precluding well drilling on federal mineral estate within boundaries of critical deer and elk winter range
- Alternative C1 - Security areas protection, field development at 160-acre well spacing; precluding well drilling and operations on federal mineral estate in security habitat areas (concentration areas) within critical winter range for mule deer and elk (BLM preferred alternative)
- Alternative C2 - Security areas protection, field development at 80-acre well spacing; precluding well drilling and operations on federal mineral estate in security habitat areas (concentration areas) within critical winter range for mule deer and elk
- No Action - field development at 160-acre well spacing on state and private lands; federal lands would be unavailable for well drilling

1.6.3.2 Legal Constraints on Alternatives

The BLM's authority to implement alternatives that would deny RGC's "right and privilege to drill for, mine, extract, remove and dispose of all oil and gas deposits" in the leased lands, as granted in BLM Form 3100-11 is somewhat limited because their mineral leases are in the nature of a contract between the Secretary of Interior and RGC. However, leases are subject not only to the explicitly attached terms and stipulations, but to the laws and regulations applicable to the management of the public lands, including the Federal Land Policy and Management Act (FLPMA). The regulations that apply to the RGC leases include the BLM Regulations Governing Onshore Oil and Gas Operations (43 CFR Part 3160). RGC operations are also subject to Notices to Lessees and Onshore Oil and Gas Orders; BLM lease stipulations conforming with leasing categories; and standard operating procedures for oil and gas operations included in the BLM Environmental Assessment Supplement on Cumulative Impact on Oil and Gas Categories (USDI, BLM 1988a). Section 302(b) of FLPMA requires the Secretary to take any actions necessary to prevent unnecessary or undue degradation of the public lands. Section 202 of FLPMA requires the Secretary to develop land use plans, and manage the public lands according to them. The land use plans that were in effect at the time of lease issuance are the Price River Management Framework Plan (USDI, BLM 1984a) and the San Rafael Resource Management Plan (USDI, BLM 1991). The terms and conditions of the laws, regulations and plans that apply to

the RGC leases with any of the action alternatives analyzed in this EIS are presented in Section 2.2.5.2 BLM Required Environmental Protection Measures and Section 2.2.5.3 State of Utah Measures Applicable to All Lands.

Because the RGC leases were issued without a no surface occupancy stipulation, BLM could require movement of RGC's proposed well locations by over 60 meters, place timing restrictions of over 60 days, or deny applications for permit to drill (APDs) only if failure to require the modifications or deny the APDs would result in unnecessary or undue environmental degradation (see Sierra Club v. Peterson, 717 F.2d.1409, 1983), or would result in a violation of applicable laws and regulations. Therefore, BLM could reject RGC's Proposed Action (well field development), and implement either Alternative B or C (restricting development of wells, transportation systems and surface facilities on federal mineral estate to lands outside of areas mapped as critical deer and elk winter range or security habitat areas) only if the Proposed Action would result in unnecessary and undue environmental degradation or violation of law. Other mitigation requirements for design of facilities, construction and operation of the project or off-site compensation for impacts may be required to minimize adverse environmental impacts to other resources and resource users as noted in Sec. 6 of BLM's standard lease form, 3100-11 as long as they do not unnecessarily or unreasonably interfere with RGC's rights to utilize their leases. Such measures may be applied as required by the appropriate BLM land use plans or to minimize the impacts identified through NEPA analysis.

Although certain APDs could be denied to avoid unnecessary or undue environmental degradation or to minimize environmental impact, denial of RGC's right to drill for, mine, extract, remove and dispose of all oil and gas deposits in the leased lands may be a breach of the lease contacts. If BLM were to deny APDs on the federal mineral estate under lease in the Project Area, RGC could proceed with administrative and judicial review to overturn BLM's decision or to seek compensation for losses under the lease contracts. BLM also could ask Congress to order the leases forfeited subject to compensation (see Union Oil Company of California v. Morton, 512 F.2d. 743, 560-51, 9th Cir. 1975). Therefore, RGC could take such actions in response to BLM's selection of alternatives and mitigation requirements.

1.6.3.3 Alternatives Considered but Eliminated from Detailed Analysis

The following is a description of alternatives that were considered but eliminated from detailed analysis, along with a brief rationale for their exclusion from consideration.

Multiple Well Completion/Directional Drilling (160- or 80-acre spacing field development). Several wells would be directionally drilled from a common wellpad, thereby maintaining the desired well spacing. Technical problems associated with directional drilling to these coals and the high costs associated with overcoming the limitations posed by the coals to directional well drilling reduce the viability of directional and horizontal drilling as a basis for an alternative to the Proposed Action.

Directional Drilling. Directional drilling can only be considered a viable alternative if the method meets the proponent's needs. To date, RGC has not proposed any directional wells. Several technical and economic aspects challenge the feasibility of directional drilling.

First, CBM wells are produced by pumping water from the coal seams to the surface; a process known as "dewatering." The water is brought to the surface using pumping units and rod actuated subsurface pumps. Wells must be nearly vertical to accommodate this production equipment. Therefore, the deviation from vertical in the wellbore must be very gentle. In the Project Area, not enough vertical distance exists, from the surface to the target formation, to drill a directional well that would access an adjacent spacing unit while still being able to accommodate a pump.

Secondly, coal exists locally in multiple seams; therefore, in order to access all of the coal, at least one lateral leg would have to be drilled into each coal seam. The technology of conventional horizontal drilling does not permit this many laterals in such a limited vertical section. Multiple laterals can be drilled using ultra-short radius horizontal drilling, but technology does not exist to drill the laterals far enough away from the wellbore to influence an adjacent spacing unit.

In addition to the above technical impediments, directional and horizontal wells are much more expensive to drill. They require larger rigs, larger drill pads, larger reserve pits, they take much longer to drill, must be drilled with mud rather than air, and they required specialized tools, surveys and expertise.

Subsurface Placement of Facilities. Subsurface placement of producing well facilities and other facilities was not considered a feasible alternative due to safety concerns and the costs associated with meeting safety and reclamation requirements. Specific costs/ risks would include:

- The potential accumulation of methane in a subsurface facility (wellhead, water separation unit) due to a leak would pose a significant risk to the health and safety of workers.

  The large additional costs associated with subsurface placement of facilities would negatively affect the economics of the project; and the health and safety issue, noted above, which would be the source of much of the additional costs, would not be totally eliminated.

- The removal and disposal of bulky waste concrete and rebar and the backfilling of underground facilities as part of reclamation would add to costs for the project, further hindering development.

Phased Project Development. A phased development approach (basis for an alternative) would consist of dividing the field into three portions. The field would be developed one portion, or phase, at a time. Development of the second phase area would not begin until the initial phase area had been drilled, produced, depleted, plugged and reclaimed (approximately 30 years). The same scenario would apply to the third phase, thus the field life would be approximately 90 years. For this discussion, the term "phase" refers to an area.

Phased development was not considered a viable alternative due to limitations posed to field development that likely reduces rate and amount of gas recovery. Such limitations could prevent RGC from meeting lease requirements, thereby exposing them to litigation by some mineral estate owners.

Correlative Rights - Leases located along a phase boundary would be negatively impacted by drainage. A non-unit lease located just inside the second phase would be subject to drainage from phase one development for perhaps 30 years before a protective well could be drilled. During the period of phase one development, formation fluids will flow from the high pressure, virgin reservoir in the phase two area to the reduced pressure in phase one. Despite having limited transmissivity data on fluid flow through coal reservoirs, significant drainage can be anticipated given 30 years of reservoir equilibration.

Loss of Reserves - Based on the same principles of drainage addressed above, reserves will be lost. Fluids will continue to flow from phase two into phase one, responding especially to the high pressure difference that will be experienced in the waning years of phase one development. The reserves recharging phase one will not likely be significant enough to extend the economic life of the entire phase.

Additionally, operators will be induced by higher profit potential to move on to the next phase before completely depleting the prior phase. Since all wells in a phase must be plugged and abandoned before to the next phase, the condition could exist where several economic wells remain in one phase, yet those wells would be plugged in order to realize the higher profits of moving onto the next phase.

Infrastructure - Infrastructure requirements will be greater for phased development. The initial start-up costs of infrastructure will be similar whether development is in one phase or three. However, in phased development, certain roads, pipelines and compressor stations will be integral to all three phases of development. These improvements will have to be maintained/replaced for three times as long.

Lease Suspensions - If lessees are precluded from developing leases for up to 60 years, lease suspensions under Section 39 of MLA would be in order. Under such a scenario, no mineral revenue, in the form of lease rentals and bonus bids, would be realized from these lands for the duration of the suspension. Such long-term suspensions are extraordinary and without legal precedent. Lessees could contest the legality of being denied enjoyment of lease rights, without stipulation, beyond the life expectancy of the lessee.

Produced Water Treatment and Use. Seven different methods of produced water disposal have been investigated and evaluated for the proposed project:

1. Injection into on-site deep wells
2. Evaporation ponds
3. Direct discharge to surface water
4. Hauling of water to an off-site injection wells
5. Treatment for beneficial use through reverse osmosis (RO)
6. Treatment for beneficial use through electrodialysis
7. Treatment for beneficial use through ion exchange

The methods were evaluated on the basis of cost of disposal, regulatory constraints, and applicability and reliability of available technology.

Methods 1 and 2, disposal into on-site injection wells and evaporation ponds have been incorporated into the Proposed Action and alternatives, and are analyzed in detail in this EIS.

Method 1. Injection into On-Site Deep Wells - It has been the long-standing policy of the BLM and its predecessor, the USGS, that the preferred disposal methodology of produced water is disposal by deep well injection. Onshore Oil and Gas Order No. 7, Disposal of Produced Water, effective October 8, 1993, reinforces this position and states in the Section III Requirements, "Injection is generally the preferred method of disposal".

Disposal into on-site injection wells is currently the most economical means of disposal. According to the Gas Research Institute (GRI) Topical Report GRI-95/0301 (GRI 1995), the cost envelope for on-site injection is $0.20 to $0.75 per 42-gallon barrel. RGC reports a current cost of $0.094 per barrel; however, that cost may vary with future injection wells. This RGC cost includes all direct and intangible costs such as land acquisition, permitting, site clearing, drilling, casing, chemicals, electricity, personnel and on-going operations costs. Due to the large quantities of water produced in CBM, locating and developing sufficient disposal reservoirs onsite has thus far proven difficult. Should onsite injection wells be incapable of accepting all of the produced water from the project, Onshore Oil and Gas Order No. 7 would require that production on federal leases be temporarily curtailed to the level of approved injection capacity, or discontinued until alternative means of proper disposal be developed. The Proposed Action would utilize evaporation ponds along with on-site injection wells.

Method 2. Evaporation Ponds - Solar evaporation ponds may be equipped with aerators to enhance evaporation. Concentrated salts would remain in the pond which if buried in place would create near-surface salt beds several acres in size. Costs given by GRI range from $0.05 to $0.15 per barrel (GRI 1995). Evaporation rates vary from season to season, making such ponds unreliable as a primary means of disposal. The large quantities of produced water prevent evaporation from being the sole method of disposal. Used in combination with other methods, evaporation ponds serve to reduce costs, and as temporary storage for the produced water.

Methods 3 through 7 have been eliminated from detailed analysis by alternative for the following reasons:

Method 3. Direct Discharge Disposal to Surface Waters - RGC had an agreement with the Price River Water Improvement District (PRWID) to discharge a portion of the produced water to the treatment plant and ultimately to the Price River. This disposal option was limited by the volume and total dissolved solids (TDS) concentration of the water. As of July 31, 1996, RGC no longer discharges produced water to PRWID.

Direct disposal to surface waters would not be an option as long as the TDS levels of produced water exceed beneficial use standards. In the event that waters encountered in the Ferron Sandstone meet beneficial use quality standards, it would be possible to directly discharge to surface waters provided NEPA analysis were completed and relevant permits were obtained.

Method 4. Hauling of Water to an Off-Site Injection Well - This would be the most expensive method of disposal with an envelope of $1.00 to $3.50 per barrel (GRI 1995). The closest commercially available well to the Project Area is near Duchesne. Disposal costs to haul water from the Project Area are estimated to be $3.90 per barrel. Given the large volumes of water to be

disposed (107,000 BWPD for the Proposed Action), this single well does not have adequate disposal capacity for the proposed project.

Method 5. Reverse Osmosis (RO) - RO involves forcing water under pressure through semipermeable membrane to produce a partially demineralized water stream and a concentrated brine solution. RO would reduce the moderate- to high-saline produced water to around 130 to 400 mg/L which would meet all beneficial use quality standards, including drinking water standards. Based on RO studies in the literature, treatment costs range from $0.30 to $1.43 per barrel of water (Stevens 1993 and Cox and Stevens 1993). Anadarko is currently testing an RO plant for the Castlegate CBM project. The estimated treatment cost is $0.40 - 0.50 per barrel based on the pilot tests (Walters 1996). Anadarko is testing the RO plant to be used only as an interim disposal method. It is not considered cost-effective as a long-term disposal option due to the high operating costs (Walters 1996). RGC has investigated RO as a disposal option. Based on information provided by vendors, RO would cost 300 - 500 percent more than their current injection cost including pipelines and water transport. For these reasons, RO is a more expensive and less reliable disposal option for disposal of CBM produced water, and it is therefore not analyzed further in this EIS. Because the process would produce high quality water suitable for community use, Carbon County or RGC could apply to the State of Utah for water rights to the produced water and develop water treatment facilities as a separate project.

Method 6. Electrodialysis - This method involves an electrochemical separation process in which ions are electrically transferred through permeable membranes to a concentrated solution. Electrodialysis is more effective than RO in dealing with fluctuations in TDS levels of the input water (Stevens 1993). Electrodialysis has not been applied to oil and gas production operations, but may be adaptable to such applications. Estimated treatment costs for partial demineralization of produced water ranges from $0.11 (not including disposal of the reject stream) to $0.30 per barrel (GRI 1995 and Cox and Stevens 1993). Because the process has not been applied to CBM production and would cost more than the proposed onsite injection, it is a more expensive and less reliable water disposal alternative, and has been dismissed from further analysis.

Method 7. Ion Exchange - Ion exchange removes dissolved solids by exchanging waterborne ions for more soluble ions as the water passes through chemical "resins". It is not specifically designed to remove salt from water, rather it changes the kind of salt. This would not provide the required treatment of the produced water from this project and it has been dismissed from further analysis.

The alternative methods of production water disposal were initially considered for the following reasons:

a. To provide potential benefits of additional water to the local community.

b. To avoid potential impacts occurring as a result of injection.

c. To provide alternate means of disposal that would enable continued development of the CBM resources in the event adequate injection facilities are unavailable.

The above alternatives are not analyzed in detail in this EIS. Implementation of any of these alternatives would require further impact analysis and NEPA documentation.

Chapter 3.0

Chapter 1.0
Tables & Figures

Chapter 2.0

Chapter 4.0

Chapter 2.0
Tables

Chapter 2.0
Figures

TABLE 1.5-1

MAJOR PERMITS, APPROVALS, AND AUTHORIZING ACTIONS POTENTIALLY REQUIRED FOR THE PRICE CBM PROJECT

Issuing Agency/Permit Name	Nature of Permit	Applicable Project Component
FEDERAL PERMITS, APPROVALS, AND AUTHORIZING ACTIONS		
USDI - Bureau of Land Management		
Permit to Drill, Deepen, or Plug Back (APD) and Sundry Notice	Controls drilling for oil and gas on federal onshore leases	Wells and production facilities
Rights-of Way Grant and Temporary Use Permit	Right-of-way grant on BLM-managed lands	Oil and gas pipelines on BLM-managed lands, roads, etc.
Cultural Resource Use Permit	Archaeological survey and limited testing on public lands. Archaeological data recovery (excavation) of sites on public lands.	All proposed action and alternative surface-disturbing activities
USDI - U.S. Fish and Wildlife Service		
Endangered Species Act Compliance (Section 7)	Protects threatened and endangered species	Any activity potentially affecting listed or proposed threatened or endangered species
Fish and Wildlife Coordination Act	Reviews design features to enhance wildlife impoundments greater than 10 surface acres total for a project	Total surface acres of evaporation ponds exceeds 10 acres

TABLE 1.5-1
(Continued)

Issuing Agency/Permit Name	Nature of Permit	Applicable Project Component
<u>USDI - Advisory Council on Historic Preservation</u>		
Cultural Resource Compliance (Section 106)	Protects cultural and historic resources; coordinated with the Utah State Historic Preservation Officer (SHPO)	All ground-disturbing activities
<u>U.S. Department of Army Corps of Engineers</u>		
Permit for Dredged or Fill Material (Section 404 Permit)	Authorizes placement of fill or dredged material in waters of the United States or adjacent wetlands	All Proposed Action and alternative surface-disturbing activities affecting waters of the United States or wetlands, such as roads and pipeline crossings
<u>Federal Energy Regulatory Commission</u>		
Certificate of Public Convenience and Necessity	Authorizes connections to interstate gas pipeline	Connection of gas gathering line to Questar pipeline
STATE PERMITS, APPROVALS, AND AUTHORIZING ACTIONS		
<u>Utah Department of Environmental Quality</u>		
Utah Pollutant Discharge Elimination System (UPDES) Permit	Authorizes discharge of pollutants to surface waters of the state	Any point-source surface discharge
UPDES General Permit for Storm Water Discharges	Controls discharge of storm water pollutants associated with industrial and construction activities	Construction activities disturbing more than five acres of land; and gas production facilities that have had a discharge of a reportable quantity

TABLE 1.5-1
(Continued)

Issuing Agency/Permit Name	Nature of Permit	Applicable Project Component
New Source Review Permit (non-PSD)	Authorizes emissions from new or modified sources	All fuel-burning sources associated with proposed action or alternative
<u>Utah Department of Transportation</u>		
Transport Permit	Authorizes oversize, overlength, and overweight loads	Transportation of equipment and materials on state highways
Encroachment Permit	Authorizes pipeline crossings or access roads tying into state or federal highways	Construction of pipeline across state or federal highways; construction of project roads that tie into state or federal highways
<u>Utah Department of Natural Resources</u>		
Application to Store and Use Explosives	Permit to use, store, or transport explosives	All Proposed Action and alternative components
Right-of-way or Special Use Permit	Authorizes activities on land purchased by Utah Division of Wildlife Resources for wildlife management objective	Facilities on land owned by Utah Division of Wildlife Resources
<u>Utah State Engineers Office</u>		
Stream Alteration Permit	Approves construction plans	Perennial stream crossings
Dam Safety Act Inspection	Inspects dam with water storage exceeding 25 ac-ft	Evaporation ponds

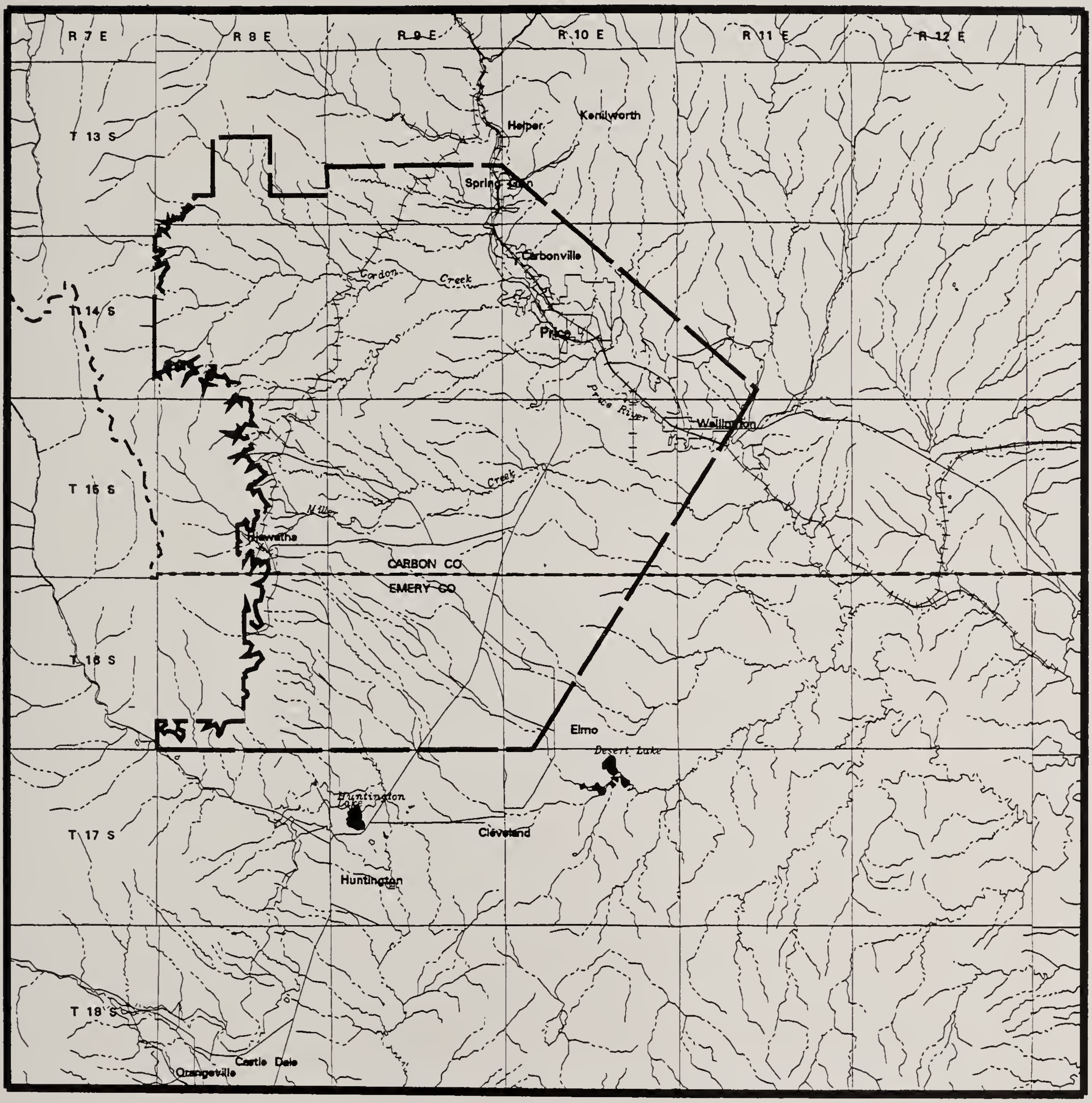
TABLE 1.5-1
(Continued)

Issuing Agency/Permit Name	Nature of Permit	Applicable Project Component
Utah Division of Oil, Gas, and Mining		
Permit to Drill, Deepen, or Re-enter and Operate an Oil and Gas Well	Approves drilling on all lands within the state	Wells
Underground Injection Control Permit	Regulates underground injection wells	Underground injection wells
Safety Regulations for Oil and Gas Activities	Regulates oil and gas activities to protect public safety	All proposed action and alternative components
Permit to Flare Gas	Regulates flaring up to 30 days of testing or 50 MMcf, whichever is less	Flaring of gas wells
Utah Division of State History, Antiquities Section		
Antiquities Annual Permit: Blanket Permit to Conduct Archaeological Investigations	Regulates all archaeological investigations on state and private lands	All proposed action and alternative surface-disturbing activities on state and private lands
Antiquities Projects Permit (Excavation)	Regulates all archaeological excavations on state and private lands	All proposed action and alternative surface-disturbing activities on state and private lands
Utah School and Institutional Trust Lands Administration (SITLA)		
Compliance with Rules	Compliance with applicable general and program rules	Facilities on SITLA lands

TABLE 1.5-1
(Continued)

Issuing Agency/Permit Name	Nature of Permit	Applicable Project Component
LOCAL PERMITS, APPROVALS, AND AUTHORIZING ACTIONS		
Carbon County, Emery County		
Special Use Permit	Authorizes extraction and processing on private lands	All proposed action and alternative components in Carbon and Emery counties
Road Use Permit	Authorizes overweight and overlength loads on county roads	Transportation of equipment and materials on county roads
Conditional Use Permit	Authorizes impoundments greater than 10 acre-feet in volume	Evaporation ponds
Encroachment Permit	Authorizes pipeline crossings, routing of pipelines parallel to county roads, and tying a project access road into a county road	Pipelines or project roads that cross or intersect with a county road
Solid Waste Permit	Regulates disposal of wastes in the county	Construction and operational waste
Building Permit	Controls construction of all structures in the county	All proposed action and alternative components in Carbon and Emery counties
Noxious Weed Act Compliance	Controls listed noxious weeds	Any occurrence of noxious weed on project facilities

Figure 1.1-1. Project Location, Price CBM EIS, Carbon and Emery Counties, Utah.



LEGEND

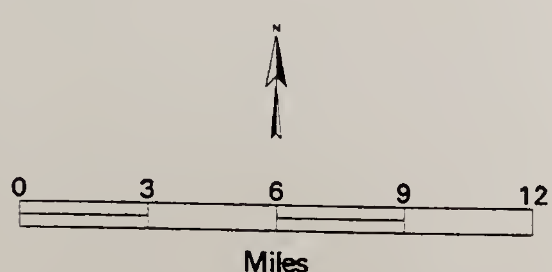
Proposed Price CBM EIS Boundary (RGC Project)

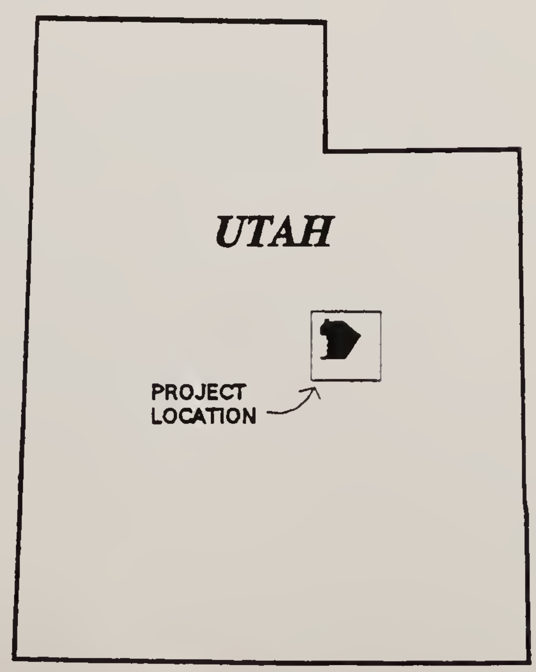
County Boundary

Primary/Secondary Roads

Railroads

Hydrology





2.1 INTRODUCTION

This section presents detailed descriptions of the Proposed Action and other alternatives, including the No Action alternative, for RGC's Price CBM Project EIS. In addition to the Proposed Action, six other alternatives have been developed that describe varying degrees of development:

Alternative A -	field development, 80-acre well spacing
Alternative B1 -	critical areas avoidance, 160-acre well spacing
Alternative B2 -	critical areas avoidance, 80-acre well spacing
Alternative C1 -	security areas protection, 160-acre well spacing (BLM preferred alternative)
Alternative C2 -	security areas protection, 80-acre well spacing
No Action Alternative -	development on state and private land, 160-acre spacing

Table 2.7-1, in Section 2.7, provides a summary comparison of the significant project features for the Proposed Action and each alternative.

The Proposed Action would entail ultimate development of (1) approximately 601 new wells, based on a 160-acre well spacing scenario, (2) associated transportation corridors (roads, pipelines, and utilities), and (3) ancillary facilities (compressor stations, injection wells, and storage/evaporation ponds) on leased federal, state, and private lands. Alternative A would entail development of 1,103 new wells, based on a 80-acre well spacing scenario, and associated facilities on leased federal, state, and private lands. Alternative B would restrict development of wells and transportation systems and surface facilities on federal lands (both 160-acre and 80-acre well spacing scenarios) to lands outside of critical deer and elk winter range. Alternative C would restrict development of wells and transportation systems and surface facilities on federal and UDWR lands (both 160-acre and 80-acre well spacing scenarios) to areas outside of those mapped as Security Areas Protection. The No Action alternative would limit additional well development to state and private lands (with appropriate state and local approvals) with grants of ROW across federal lands for access where necessary.

2.2 PROPOSED ACTION - FIELD DEVELOPMENT, 160-ACRE WELL SPACING

This section describes the Proposed Action, and features common to all alternatives. The Proposed Action and alternatives differ primarily in numbers of facilities. The discussion of permitting, methods of construction, operation procedures, and environmental protection measures applies to all alternatives. Differences between the Proposed Action and alternatives are presented in Sections 2.3 to 2.6.

RGC proposes to locate, drill, complete, and produce 601 CBM wells over 10 years or more in an approximately 290-square mile Project Area in Carbon and Emery counties, Utah (Plate 2). A maximum of four CBM gas wells per square mile (160-acre spacing) would be developed on leased acreage in accordance with procedures and guidelines of the Utah Division of Oil, Gas & Mining (UDOGM) and the BLM (Sections 2.2.1.1 and

2.2.5.3). The Proposed Action also includes the construction and operation of access roads, gas and water collection pipelines, high-pressure gathering pipelines, and electrical utilities within a transportation corridor system accessing all wells. Approximately 350 miles of transportation corridors would be constructed and operated. Total width of disturbance for a corridor would vary with type or class of road (width requirements per BLM requirements, Appendix 2A). Additional ancillary facilities to be constructed and operated include 5 new compressor stations, 7 injection wells for the disposal of produced water, and 7 storage/evaporation ponds (Table 2.2-1). The number and/or miles and associated acres of disturbance for the wells, transportation corridor, and ancillary facilities as distributed over federal, state-UDWR and Utah School and Institutional Trust Lands Administration (SITLA), and private lands are presented in Table 2.2-1. Disturbance areas for split estate lands (non-federal surface ownership with federal mineral ownership) are shown in Table 2.2-2.

Disturbance acreages shown in Table 2.2-1 identify both initial short-term disturbance and long-term disturbance. Short-term disturbance (1-3 years) would include temporary construction disturbance. Long-term disturbance would include life-of-project facility disturbance.

Reclamation would beginning as soon as is appropriate after construction, in areas of short-term disturbance to return these areas to productive use, primarily livestock grazing and wildlife habitat. Construction work areas within the ROWs for both pipelines and electrical distribution lines comprise most of the disturbed areas that would be reclaimed.

RGC proposes to develop the 601 wells over approximately 10 or more years at a rate of up to 100 wells per year. A proposed field development scenario for the years 1996 to 2006 is presented in Plate 3. Project life is anticipated to be 30 or more years (10 or more years to develop all wells and 20 year life of a well).

A representative schedule of construction and operation disturbance is presented in Table 2.2-3, which shows how the construction, operation, and reclamation effects to the land surface could be distributed over the 30-year life of the project. As shown in Table 2.2-3, the total area disturbed at any one time would be substantially less than the total area of construction (short-term) disturbance presented in Table 2.2-1, and would be equal to the operational facilities constructed up to that point plus the construction disturbance resulting from that year's activities. About 40 percent of the construction disturbance would be revegetated at the end of each construction year, and operational facilities would be reclaimed over an estimated 10-year period at the end of the project. A similar schedule of activities would occur with the other alternatives.

As of the end of 1995, RGC has developed 98 wells (89 producing wells and 8 coreholes [test wells] and one injection well), 58 miles of transportation access corridors, a single compressor facility, a single injection well, and a single evaporation pond on mostly state and private lands within the Drunkards Wash Unit within the Project Area. The Drunkards Wash Unit is a federal oil and gas administrative designation allowing multiple leases to be managed as one unit by an operator. For purpose of analysis, it is assumed that the coreholes would become producing wells, and they are counted as part of the existing environment. RGC initiated

activity in the Unit in 1991 with the drilling of a single well, continuing with 12 new wells in 1992, 20 wells in 1993, 40 wells in 1994, and 25 wells in 1995. The number and/or miles and associated acres of disturbance for the existing wells, transportation corridor, and ancillary facilities as distributed over federal, state, and private lands are presented in Table 2.2-4. Approximately 7 acres of federal land have been disturbed as part of a well location and approved Grants of ROW previously provided by the BLM for access across federal land.

Specifics on the development of RGC's proposed field development project are discussed by phase of project development. The four phases of the project are:

1. Preconstruction planning and siting
2. Construction and drilling
3. Production
4. Reclamation and abandonment

The four project phases are described in Sections 2.2.1 through 2.2.4.

Raptor Restricted Wells and Winter Closure Areas

Two environmental protection measures to be implemented by BLM as part of the Proposed Action and other alternatives may have important effects on the project and on public use of the Project Area. These two measures are (1) restriction of construction on BLM lands within 0.5 miles of raptor nests known to have been occupied within the previous 3 years, and (2) closure of select roads during winter months (December 1 to April 1) to the general public to reduce disturbance of big game during the winter period.

Within the 0.5-mile buffer area surrounding a raptor nest active within the past three years, construction of new wells would be disallowed unless a variance were granted by the authorizing BLM officer. Proposed wells and associated transportation corridor segments on federal lands that are located within a 0.5-mile radius of raptor nests occupied during the period of 1993 to 1995 are identified in Plate 2 for the Proposed Action and in the plates for the alternatives. Numbers of affected wells and miles of affected transportation corridor are presented in Table 2.2-5 for the Proposed Action and alternatives.

Motorized vehicle access would be managed in portions of the big game winter range to reduce disturbance to wintering big game. Locked gates would be used to limit access to these areas to RGC and contractor personnel, land owners, and agency personnel. Motorized vehicle access would be limited to necessary operational and maintenance activities for the production wells and compressor stations, to travel to private in-holdings, and to agency activities. Proposed wells and transportation corridor segments located within the winter closure areas are identified in Plate 2 for the Proposed Action and in the figures for the alternatives. Locations for winter access gates are listed by section, township, and range below and are also presented in Plate 2 and the figures for the alternatives.

Locations of Proposed Gates for Winter Closure of Big Game Critical Winter Range

Sec. 33, T16S, R8E	Sec. 15, T16S, R8E
Sec. 16, T15S, R9E	Sec. 14, T15S, R9E
Sec. 18, T15S, R9E	Sec. 31, T14S, R8E
Sec. 24, T14S, R8E	Sec. 18, T14S, R9E
Sec. 9, T14S, R9E	Sec. 3, T14S, R9E
Sec. 4, T14S, R9E	Sec. 31 (n), T13S, R9E

Sec. 31 (s), T13S, R9E	Sec. 36,(s) T13S, R8E
Sec. 36,(n) T13S, R8E	Sec. 31 (3rd), T12S, R9E
Sec. 35 (n), T13S, R8E	Sec. 35 (s), T13S, R8E
Sec. 27, T13S, R8E	

The wells and road segments affected by winter closure are also shown on Plate 2 and are summarized quantitatively in Table 2.2-6.

2.2.1 Preconstruction Planning and Siting

RGC would follow the procedure outlined below to gain approval for the proposed activity on federal public lands within the EIS Project Area. Development activities on federal lands would be administered by the BLM. Development activities on private/fee and State of Utah lands would be administered by the UDOGM. UDOGM permitting requirements and procedures would be applied as well as the sequential federal permitting process and procedures defined in the following section.

2.2.1.1 Federal Permitting Process

A Federal oil and gas lease issued by BLM, under the authority of the Mineral Leasing Act of 1920, grants the lessee the exclusive right to explore for and develop oil and gas resources on that lease, subject to the terms and conditions of the lease. Before exercising those rights and drilling a well, the lessee or lease operator must obtain approval from BLM. Details on this permitting process are identified in 43 CFR 3162 and Onshore Oil and Gas Order 1.

The operator is required to submit an APD to the BLM. A complete APD consists of a surface use plan, a drilling plan, evidence of bond coverage and other information that may be required by applicable regulations, Orders or Notices. A Surface Use Plan of Operations describes the surface uses, access, water supply, well site layout, production facilities, waste disposal, and restoration associated with the proposal. The Drilling Plan describes the technical drilling aspects of the proposal, including subsurface resource protection, public safety and royalty accountability. On split estate leases (Federal minerals/non-Federal surface ownership) the operator is responsible for reaching agreement with the landowner.

The process of obtaining approval to drill is begun by filing a Notice of Staking (NOS) or APD with the BLM. The choice is the operator's, but eventually, a complete and acceptable APD must be filed. By filing a NOS, the operator triggers an onsite field inspection before filing an APD and is furnished appropriate surface use and reclamation requirements for incorporation into the APD. This may result in a more "complete" APD which can be approved in less time. If the APD option is selected, the onsite inspection is completed after filing of the application.

The purpose of the onsite inspection is to identify specific problems and potential environmental impacts associated with the proposal and to determine methods to mitigate these impacts. The APDs submitted by the operator should be consistent with the information provided in this EIS. Mitigation and approval conditions for individual APDs would be derived from protection measures developed in this EIS and would be consistent with lease rights.

After drilling, the BLM has approval authority for a variety of other related activities. Routine well operations do not require

approval, but any changes to an approved APD, certain subsequent well operations, and all subsequent activities with new surface disturbance require prior approval. Complete details of subsequent well operations are contained in 43 CFR 3162.3-2. Disposal of produced water from Federal leases requires prior approval as outlined in Onshore Oil and Gas Order 7. BLM also approves well plugging and abandonment of wells, hydrogen sulfide protection measures, gas venting and certain production handling measures.

Access roads and pipelines on BLM managed lands outside a lease or unit require a ROW. A NOS or APD is acceptable as a ROW application for those off-lease facilities if the application details the entire proposal.

2.2.2 Construction and Drilling Phase

The following is a description of proposed construction techniques to be implemented by RGC as part of the second phase of development. The techniques and procedures outlined would be applicable to all wellpad, well drilling and development, access road, pipeline, electrical transmission line, and construction and development activities, associated with the Proposed Action and all alternatives.

Substantial quantities of water and sand/ gravel would be required to support the CBM well field development. Specific sources, needs, and estimated quantities are summarized by activity and alternative below.

<u>**Water**</u>

Fresh water needed for construction and operation would be purchased or leased through agreements with the PRWID, NELCO Contractors and other individual owners in the areas. RGC has installed a buried pipeline from the Carbon County Fairgrounds to the existing development that carries fresh water from PRWID. Water is also withdrawn directly from the Carbon Canal (Jensen 1996). All water being used by the project is backed by Scofield Reservoir.

RGC has filed for water rights on water produced from 84 existing production wells, but does not intend to file for any additional wells.

RGC intends to limit fresh water consumption to road and pad construction, well drilling and completion; and post-construction magnesium chloride application. RGC intends to use magnesium chloride for dust suppression on all constructed roads. Based on 1995 water use by RGC, the following is the estimated water consumption for the Proposed Action:

- Road and well pad construction - 0.36 ac-ft per mile of road
- Production well drilling and completion - 0.59 ac-ft per well
- Injection well drilling and completion - 1.26 ac-ft per well
- Compressor station construction - 0.24 ac-ft per site
- Evaporation pond construction - 0.14 ac-ft per site

Based on these water requirements, the total estimated fresh water consumption for the Proposed Action is 494 ac-ft Some additional water may be needed for road maintenance such as re-grading. However, RGC intends to plan this activity to maximize use of storm water. No water was used for road maintenance in 1995 (Jensen 1996). Table

2.2-7 shows the estimated water demands by alternative.

Sand and Gravel

Sand and gravel would be used for constructing well pads, compressor stations and roads. The material would be obtained at market prices from existing, permitted gravel sites on private land. There are adequate existing sand and gravel supplies in the area to support the project and other users (Branson 1996). The estimated sand and gravel application rates for the different type of facilities is provided in Table 2.2-8. The rates are based on a depth of 4 inches of gravel for all facilities. All road travel ways would be covered with sand and gravel. An estimated half of the area of the well pads and compressor sites would be surfaced with gravel. Construction of each evaporation pond would require sand/gravel surfacing of approximately 0.3 acre of access road around each pond.

Based on these gravel requirements, the Proposed Action would require an estimated total of 641,046 yd^3 of gravel.

Labor Force and Traffic

Estimated employment requirements for CBM field development, operation, and reclamation are provided in Table 2.2-9, including type of work, timing requirements, number of personnel per crew, and number of crews to be active at the same time. These are identified for each of the facilities described in the remaining parts of Section 2.2.2, 2.2.3, and 2.2.4.

Project-related vehicular traffic is presented in Appendix 2C, by facility/activity. A summary of traffic and comparison by alternatives is presented in Section 4.11.

2.2.2.1 Access Road Construction

Development of RGC's CBM field would require the construction of additional roads within transportation corridors to access wellsites and ancillary facilities (i.e., compressor stations, injection wells, evaporation ponds), and to facilitate construction of parallel pipelines for gas and produced water on one side of the access road and electrical utility transmission lines on the opposite side of the road. The adjacent and parallel linear siting of access roads, gas and water pipelines, and electrical cables form a transportation corridor; a network of transportation corridors connect wells, compressor facilities, and produced water disposal facilities.

Under the Proposed Action, 350 miles of transportation corridor would be constructed resulting in approximately 2,916 acres of initial disturbance (approximately 8 acres per mile of corridor). With the reclamation of disturbed areas above the pipelines and electrical cables, long-term disturbance associated with maintaining the access roads would total 1,402 acres (approximately 4 acres per mile of corridor).

An expanded road system consisting of three classes of roads would be constructed and maintained for the life of the field (Plate 2).

Access to the Project Area would come from the following main improved federal, state, county, and BLM roads (Plate 2):

- Federal Highways - U.S. Routes 6 & 191
- State of Utah Highways - State Routes 10, 139 (Gordon Creek Road), 122, and 155

- Carbon County Roads
  - Wattis Road (60)
  - Pinnacle Creek Road (6571)
  - 1500 East Road
  - Miller Creek Road (6549)
  - 5600 S. Ridge Road (6569)
  - Stark Farm Road (6588)
  - Pleasant Creek Road (6584)

- Emery County Roads
  - Hiawatha Road (301)
  - North Elmo Highway (101)
  - 105 Road

- BLM Roads
  - Haley Canyon Road (6572)
  - North Spring Canyon (6515)

Additional access would come from the extension of RGC's existing road network already in place on state and private lands (Plates 1 and 2).

The three classes of road to be constructed in addition to the road system already in-place (state, county, BLM, and RGC) include:

1. Collector Roads - defined as all existing or planned roads that are necessary for support of existing facilities. This type of road normally provides access to larger blocks of land and connects with, or is an extension of, an existing public road system. Both existing and proposed collector roads for the Proposed Action are identified on Plate 2. Collector roads receive a high volume of traffic and usually require application of the highest road construction and maintenance standards used by the BLM. The design speed is 25 miles per hour (mph) and the minimum travel way width is 20 feet (a minimum of 20 feet to a maximum of 30 feet; a 24-foot travel way width is used for analyses purposes; actual width would be determined on a site-specific basis in coordination with the BLM, state, or private landowners). The total construction width of the transportation corridor, including the road and adjacent pipeline and electrical lines, would be 93 feet (Figure 2.2-1).

2. Local Roads - defined as those existing or proposed roads that would serve the development of a depletable natural resource or temporary facility. These lower volume roads usually provide the internal access network within an oil/gas field. Both existing and proposed local roads for the Proposed Action are identified on Plate 2. The design speed is 20 mph and the travel way width is 20 feet (a minimum of 20 feet to a maximum of 24 feet). The total construction width of the transportation corridor would be 85 feet.

3. Resource Roads - defined as those existing or proposed roads that serve the development of a limited area of a depletable natural resource. These minimal volume roads usually provide the final segment of access to a wellsite. Both existing and proposed resource roads for the Proposed Action are identified on Plate 2. The design speed is 15 mph and the travel way width is 16 feet (a minimum of 16 feet to a maximum of 20 feet). The total construction width of the transportation corridor would be 77 feet.

Specific survey, design, construction, and mitigative standards for Collector, Local, and Resource roads are presented in Appendix 2D.

Although some of the proposed new roads potentially follow segments of existing road or tracks, for the purposes of analysis, it is assumed that new construction would be required. Access roads across public lands would be designed and constructed in accordance with BLM Manual 9113 standards. The design and staking of all permanent roads (i.e., those collector, local, and resource roads to be used by RGC for the life of the project) to be constructed across public lands would be conducted under the direction of a licensed, professional engineer. Road construction would be monitored by a qualified professional engineer or qualified inspector, as deemed appropriate by the BLM.

Construction equipment and techniques to be employed by RGC and their contractors would be standard for the industry (crown-and-ditch method). A typical roadway cross-section with width specifications for the three classes of road is presented in Figure 2.2-1. Heavy equipment and support vehicles would be required (bulldozer, grader, track hoe, front end loader, and heavy- and light-duty trucks). Clearing of vegetation and blading of soil materials would be limited to areas of construction; bladed vegetation and topsoil materials would be windrowed for future redistribution during interim and final reclamation (Appendix 2B). All roads would be constructed with appropriate, adequate drainage and erosion control features/ structures (e.g., cut and fill slope and drainage ditch stabilization, relief and drainage culverts, water bars, wing ditches, and rip-rap) (Appendix 2B).

RGC proposes to place 4 inches of sand and gravel on all newly constructed collector and local class roads to provide a year-round travel way surface. Sand and gravel may not be applied to resource roads accessing exploration and new development wells prior to drilling; the need for surfacing would be determined in consultation with the BLM or other landowner based on site conditions including native soil material and moisture conditions, steepness of grade, and anticipated seasonal constraints. However, sand and gravel surfacing of roads is assumed for the purpose of analysis. Sand and gravel materials for all uses would be obtained from local permitted, commercial sources. RGC would maintain all lease roads periodically or as needed. Pre-existing county roads would be maintained by the respective County.

Water purchased from local sources would be used in initial road construction and sand/gravel surfacing at rates of approximately 253 and 240 bbl per acre, respectively. Water would be used to improve workability of the soil and sand and gravel.

2.2.2.2 Wellpad Construction

A leveled area of approximately 300 by 200 feet (1.4 acres) would be graded during wellpad construction by a bulldozer after construction of a rough access road to the wellsite. Vegetation would be cleared and topsoil stockpiled within the wellpad area, in contiguous berms upslope of the wellsite for future use in reclamation. Standard cut-and-fill construction techniques and machinery (bulldozer and/or grader) would be used to stockpile soil, which would occur before leveling activities. A drilling pit (50 by 50 by 6 feet deep) would be constructed on the wellpad to receive drill cuttings.

At well locations requiring minimal grading or where soils are saline and/or alkaline, topsoil would be salvaged only in areas of the

drill cutting pit and where topsoil is to be stockpiled in berms to facilitate future reclamation. Wellpad surfacing with sand/gravel would not be required unless weather or soil moisture warrants surfacing to minimize soil disturbance and promote efficient well development and maintenance operations. However, sand and gravel surfacing of approximately one-half (0.7 acres) of each 1.4-acre well pad is assumed for the purpose of analysis (Table 2.2-8). A well pad would require 376 yds^3 of sand and gravel. Approximately 227,000 yd^3 of sand and gravel would be required for the proposed 601 well pads under the Proposed Action.

2.2.2.3 <u>Pipeline Construction</u>

Four types of pipelines would be constructed as part of the Proposed Action:

- Gas-gathering pipelines system
- Produced water-gathering pipelines system
- High pressure gas delivery pipelines (compressor station to existing Questar pipelines)
- High pressure gas interconnect pipeline

As part of the transportation corridor system, linking the CBM wells and ancillary facilities, gas-gathering pipelines and produced water-gathering pipelines would be constructed, placed together in the same trench/ditch, and buried to and parallel with the access road (Figure 2.2-1). Construction and installation of pipelines would immediately follow construction of the access road and wellpad and coincide with well drilling. They would conduct gas and produced water from the producing wells to the compressor facilities and produced water disposal facilities, respectively. Gas and water pipelines would be constructed of polyethylene or steel pipe with outside diameters (OD) of 2 to 18 inches for gas and 2 to 18 inches for water. Most would be constructed within transportation corridors; however, 35 miles of pipeline and utility lines would be installed in 40-ft ROWs adjacent to existing roads. The gas and water pipelines would be constructed with manholes to provide access for maintenance and operational purposes. The location of the manholes would vary depending on the specific pipeline characteristics. Each manhole would be protected by an above-ground barricade that is painted yellow for safety purposes.

High-pressure gas pipelines (6 to 16 inches OD) would be constructed to connect the five new gas compressor facilities to the two existing Questar Pipeline Company gas transmission pipelines which traverse portions of the Project Area (Plate 2). These existing transmission pipelines within the Project Area consist of (1) a 20-inch OD pipeline running roughly east-west just north of Price across the northern portions of townships T14S, R10&9E and the southern portion of T13S, R8E and (2) a 12- and 6-inch OD pipeline system (adjacent and parallel) west of Price, running roughly south-north across the eastern portions of townships T16, 15, & 14S, R9E to its intersection with the east-west 20-inch OD in Section 12, T14S, R9E. New high pressure pipeline would be installed in a separate ditch either within transportation corridors (Figure 2.1-1) or in 40-ft ROWs along existing roads.

To increase delivery capacity for the proposed field development, a new 12-inch OD high pressure interconnect pipeline would be constructed and operated in parallel and adjacent to the existing south-north 12- and 6-inch pipelines. The new pipeline would begin in Section 26, T16S, R9E, and terminate at its intersection with the east-west 20-inch OD Questar line in Section 12, T14S, R9E. This

new 12-inch OD pipeline would be constructed in and placed in a separate ditch within a proposed 40-foot pipeline ROW of adjacent to the Questar pipeline ROW.

The exact pipeline location would be surveyed and staked prior to construction activities. Design plans for pipeline construction on steeper slopes would be submitted to the BLM for approval as required. The pipeline corridor would be cleared of trees and heavy brush by blading the surface prior to any activities. Where feasible, trees would be avoided. Brush and woody vegetation would be left in-place and driven-over as necessary (crushed but potentially capable of redeveloping a vegetative canopy). Soils would be left relatively undisturbed for much of the construction work area, although some compaction may occur.

Pipeline construction would occur in a planned sequence of operations along the 40-foot-wide ROW (includes approximately 15 feet of previous road or pipeline disturbance and current road disturbance). Construction would be completed using the following steps: pipe stringing, trench excavation, pipe lowering, pipe padding, and trench backfilling materials, equipment, and techniques, including quality assurance/control checks, standard for the industry. The pipeline trench would be excavated mechanically with a track excavator to a depth that allows 3.5 feet of material to be placed on top of the pipeline. Trench width would likely range from approximately 18 to 36 inches depending on the number of pipelines and the diameter of pipe placed in the trench bottom. Soil would be backfilled promptly into the trench following installation. Each gathering pipeline would be tested with fresh water and/or air pressure to locate any leaks prior to the pipeline being placed into service. After completion of hydrostatic testing, waste water would be introduced into the water collection and disposal system for final disposal (injection or evaporation). Site regrading would occur where necessary. Reclamation of the portion of the construction ROW not to be retained as part of the adjacent road (approximately 25 feet) would be initiated per landowner requirements (BLM, state, or private) so as to return this temporary, short-term disturbance area to productive use and to stabilize soils.

2.2.2.4 Electrical Distribution Line Installation

Electricity would be used during well development and to initiate and maintain production.

Based on present power demands for existing facilities, anticipated monthly electricity usage in kilowatt hours (KWH) by facility is as follows:

Production well	2,877 KWH
Injection well	166,400 KWH
Compressor facility	5,353,635 KWH
Evaporation pond	14,385 KWH

The above-noted compressor facility is all electric (7 electricity-powered compressor units). RGC proposes that future compressor units be either electricity-powered or gas-fired. For purposes of analysis, it is assumed that half of the units would be gas-fired engines.

Electricity would be routed to wellsites and ancillary facilities within the transportation corridor. Electrical power cables or lines would be installed underground adjacent to the road on the side opposite the pipeline(s) ROW (Figure 2.2-1). Power line construction would follow access road surfacing and coincide with the completion of well drilling. Electrical junction boxes would be installed as

necessary by the public utility. These boxes would be painted to blend with the surrounding environment after each well site begins operation.

Three-phase or single-phase distribution lines would connect well locations and other facilities with the existing transmission and distribution system within the Project Area. Underground installation would follow industry standard procedures and would reclamation activities would be similar to those for underground pipeline installation. Installation would occur within a 20-foot-wide disturbance ROW, of which 10 feet overlaps with the adjacent access road and the remaining 10 feet is new disturbance.

2.2.2.5 Well Drilling and Casing

Following construction of the access road and wellpad, a mobile drilling rig would be transported to the wellsite and erected on the wellpad. Additional equipment and materials needed for drilling operations would be trucked into the wellsite. An approximate layout of the wellpad during drilling activities is presented in Figure 2.2-2.

The active phase of drilling would begin by setting the four tie down anchors to guy the derrick tower and digging a rectangular pit, called a cellar, where the hole would be drilled. The cellar would provide space for the casing head spools and blow-out preventers that would be installed under the rig. Drilling operations normally include (1) keeping a sharp bit on bottom drilling as efficiently as possible, (2) adding a new joint of pipe as the hole deepens, (3) tripping the drill string out of the hole to put on a new bit and running it back to the bottom, and (4) casing installation and cementing in the hole. Typically, an 11-inch (diameter) hole would be drilled to a depth of 300 feet; a 7 7/8-inch hole would then be drilled to a depth 250 feet below the lowest target coal seam.

Completion of well drilling operations would involve the placement and cementing of well casing. Placement of casing (casing the hole) would entail the insertion of a continuous steel pipe into the drill hole from the bottom of the hole to the surface. Casing would be set in the hole one joint at a time and would be threaded at one end with a collar located at the other end, to connect each joint. Each well would be completed with 8 5/8-inch to 9 5/8-inch surface casing to a depth of 300 feet and 5 1/2-inch to 7-inch production casing to total well depth.

The casing would be cemented into place by pumping a slurry of dry cement and water into the casing head, down through the casing string to the bottom, and then up through the spacing between the casing and the wellbore (annulus) to the surface. A plug and acid rinse is pumped to the bottom of the wellbore to remove any residual cement from the inside walls of the casing. Sufficient cement would be pumped into the annulus to fill the space where it would be allowed to harden. A cement bond log would be run on the wellbore to ensure that no voids remain in the annulus. Cementing the annulus around the casing pipe:

- Restores the original formation isolation by posing a barrier to the vertical migration of fluids between rock formations within the borehole
- Protects the well by preventing formation pressures from damaging the casing
- Retards corrosion by minimizing contact between the casing and corrosive formation fluids

Final well depths are anticipated to range from approximately 1,400 to 3,800 feet. All drilling operations and other wellsite activities would be conducted in compliance with applicable BLM and UDOGM rules and regulations. RGC anticipates using two to six rigs during the drilling period on federal lands and when conditions permit on state and private lands. Each drilling rig would be rated to accommodate UDOGM rules and regulations.

All wells would be completed in the Ferron Formation using vertical air drilling techniques, unless special conditions arise requiring drilling mud (such as substantial water). To date, minimal drilling with mud has been required. With air drilling, compressed air and a slight amount of surfactant would be used to remove drill cuttings from the hole and control pressure. Excess surfactant and cuttings would be blown into the drilling pit for disposal (Figure 2.2-2). Single well completions per wellpad are projected for all wells.

Trucks would be used to transport drilling components to the work site. Rig components are designed for portability and are easily loaded and unloaded and mostly self-contained on the mobile drill rig. Auxiliary equipment for the supply of electricity, compressed air, and/or water would be trucked in for drilling operations. Drill pipe, drill bits, cement, water, wire rope, and other needed supplies would be trucked into the wellpad and stored temporarily until used.

The Proposed Action would require approximately 4,600 bbls (0.59 ac-ft) of water per well for cement preparation, well stimulation, dust control and possibly drilling (as discussed above, drilling mud may be required to handle certain downhole problems).

During drilling operations, certain waste waters would be generated, including frac fluids, and potentially, drilling fluids, in addition to the produced water. Where limited quantities of frac fluids, (a mixture of water, guar gel, sand, and pH- and bacteria-control chemicals) drilling fluids, or other waste water liquids are generated during drilling, such water would be discharged into an unlined pit constructed at the site. After drilling, the water in the pit would be allowed to evaporate. After the drilling pit is completely dry, the pit would be backfilled.

Each well is expected to be drilled in a period of one to six days; an average of four days is anticipated. As many as six drill rigs would be operating during the proposed annual drilling and construction period set between April 15 and December 15.

2.2.3 Production Phase

The following is a description of proposed production techniques for the third phase of development. The techniques and procedures outlined would be applicable to well completion and stimulation activities, and installation and operation of production facilities associated with all alternatives.

2.2.3.1 <u>Well Completion and Stimulation</u>

In preparation for production of CBM gas from a drilled and cased well, a well completion program would be initiated to stimulate production of gas and to determine gas and water production characteristics. A mobile completion rig similar to the drill rig is used to complete a well. The well completion process, lasting 7 to 14 days, includes perforating the well's steel casing, hydraulically fracturing the producing formation, and installing a series of valves and fittings on the wellhead (called a "Christmas tree").

Well casing perforation involves the creation of holes in the casing wall to provide a flow path into the well from the target coal interval. Holes are produced by the explosion of a shaped charge placed within the well casing at the desired depth interval. Energy produced by detonating the shaped charge is directed through the well casing wall and hardened cement. The holes through the cement and well casing allow pumped fluids to enter the formations and stimulate the inflow of CBM gas and produced water. Each well would be stimulated using a standard process known as hydraulic fracturing, which stimulates production by increasing the permeability of the producing formation. In hydraulic fracturing, frac fluid is pumped under extremely high pressure downward through the casing or tubing and out through the perforations in the casing. The pressurized fluid enters the formation and parts or fractures it.

Sandgrains or other proppants (aluminum pellets, glass beads, or similar materials) are carried in suspension by the fluid into the fractures to "prop open" the fractures in the coal. When the pressure is released at the surface, the fracturing fluid returns to the well, and the fractures partially close on the proppants, leaving channels for gas to flow through them into the well. Installing the Christmas tree and associated tubing is the final step of the wellbore work.

Even though the produced water and gas can flow into the casing after it is perforated, a small diameter pipe, called tubing, is placed in the well to serve as a way for the produced water to be brought to the surface. The tubing is run into the well. Typically, tubing is placed below the perforated interval to allow any fluid to be pumped up the tubing to the surface. At the surface, the collection of valves (Christmas tree) sits at the top of the well head. The tubing in the well is suspended from the Christmas tree, so as the well production flows up, it enters the Christmas tree. As a result, the production from the well can be controlled by opening and closing valves on the Christmas tree.

All completion activities would be limited to daylight hours, when possible. There would be minimal venting of gas at wellsites during completion and/or well connection to flowlines. The minimal amount of venting could occur when the well is flowed to surface following hydraulic fracturing. The flowing back of a well is necessary to purge the coalbed of fluids used in the fracturing process. During the process of flowing back the well, slight amounts of CBM gas are produced. The gas and water are flowed to the drilling pit, to temporary storage tanks on location, or to the gas and water gathering pipeline systems, if operational. Any gas entering the tanks with the water is separated and vented to the atmosphere. The venting would only occur during the recovery of the water and last for a matter of days. Any gas venting would be in accordance with BLM's Notice to Lessees 4A. After the water used in the fracturing is recovered, the well would be tied into the gas and water collection system.

Flaring may be necessary following completion of wells located distant from the existing pipeline infrastructure to determine whether the wells are capable of production in sufficient quantities to justify pipeline installation. It is assumed that RGC may flare up to five wells in the northwest of the Project Area and five wells in the south. Flaring would be done in accordance with all applicable laws, rules, and regulations, including as appropriate, compliance with Utah Administration Code Rule R-649-3-20(5) and BLM Notice to Lessees-4A.

All areas not needed for production facilities would be topped with the previously stored topsoil. The drill pit would be dried and backfilled prior to topsoil placement. Seeding of these areas would take place in the fall.

2.2.3.2 Production Facilities and Operations

Gas Production, Treatment, and Collection

Installed surface production facilities would include the Christmas tree, a pumping unit (either a walking beam pumping unit or a progressive cavity pump), separation facility, gas metering facility, and connections to the gas and water collection systems (Figure 2.2-3). All would occupy less than one acre. The pumping unit would be powered by an electric motor and would be used to lift the produced fluid stream from the production zone, allowing the gas to flow by reducing the hydrostatic pressure on the coals.

The produced fluid stream contains CBM gas and water. CBM gas production is a relatively new technology, and the application of this technology to CBM gas production from the Ferron Formation was only recently initiated. Therefore, no long-term production history exists to definitively state trends in production performance in this area. However it is assumed that the CBM gas production rate for each well should increase the first few years, then gradually decline (RGC 1995). Based on a zero-time plot analysis used by RGC for predicting gas production, the estimated peak gas production for the Proposed Action is 272 million cubic feet per day (MMcf/day).

The produced stream requires separating water in a two-phase separator at the wellsite that would yield gas and produced water. Following separation the gas is filtered, metered, and introduced into the gathering system for transport to a compressor facility. Separated, produced water would be transported via the produced water gathering system to approved disposal wells and/or evaporation ponds. The remaining on-site facilities on the surface are a progressive cavity pump or reciprocating pump (walking beam unit), a vertical separator and meter house to treat and measure the gas, and a free standing electric-powered computerized monitoring, control, and telemetry panel.

Leak detection measures would include the following three activities:

1. Field Balances - Field personnel would routinely calculate balances between wells and collection/transfer points (ponds and compressor sites) to insure that volumes match within acceptable tolerances.

2. Pressure Maintenance - Significant leaks in gas or water pipelines would cause a loss of pressure detectable by the automation system at the separator dump or static pressure on the meter run. If this is detected, a well would be shut-in automatically and an alarm would be sent to the main computer. The shut-in point is determined for each well based upon individual operating conditions. Field leaks would then be pinpointed using field pressures and the situation corrected.

3. Gas Sniffers - All gas pipelines would be surveyed annually with highly sensitive gas-leak detection equipment. This equipment is capable of detecting leaks as small as that produced by a cigarette lighter.

Gas Compression

Produced CBM gas under well head pressure would move through the flowlines gathering

system to a compressor facility. Gas arriving at the compressor facility would be compressed to facilitate transport and introduction of the gas into an existing transmission pipeline. RGC projects that pressures at each well head would be about 10 to 40 pounds per square inch gauge (psig). Compression of the gas at the compressor facilities would increase the pressure to approximately 700 psig. Accounting for transport pressure loss, the gas would be delivered via high-pressure pipeline to a Questar Pipeline Company gas transmission line interconnect at a pressure of approximately 690 psig.

In addition to the existing electricity-powered compressor facility operated by RGC located in the N/2 of Section 1, T15S, R9E, RGC would construct and operate five additional compressor facilities. Location, capacities, and important components of the six compression facilities are presented in Table 2.2-10 and Plate 2. The layout of a proposed compressor facility would be similar to that presented in Figure 2.2-4. Each compressor station would be fenced with six feet of chain link with one foot of barbed wire on top. Long-term disturbance for the construction and operation of a compressor facility for the life of the project would total approximately 5 acres, including an adjoining one-third acre electrical substation.

For the purpose of air quality analysis, it is anticipated that compressor units would have 1,700 HP engines, either gas-fired or electricity-powered. Compressor units would be installed and operated at the five additional compressor facilities. Each of the six facilities would use a total of 65 compressor units, with individual facilities using between 6 and 17 compressor units. Assuming a rate of 5 MMcf/day/unit (operating range between 3 and 8 MMcf/day), compressor capacity would total 325 MMcf/day. This capacity would accommodate the estimated peak gas production of 272 MMcf/day for the total 698 wells operating in the Project Area (97 existing and 601 proposed wells). Gas production forecasting for the Proposed Action and each alternative was developed based on a zero-time plot analysis of actual production from the Drunkards Wash Unit.

Individual gas-fired compressor units would be equipped with clean-burn control technology. Compressor facilities and individual compressor units would be inspected daily.

Eight 250-watt, clear lamp lights would be installed to light each compressor facility. Each light would be pole or building mounted and directed downward to illuminate key areas within the facility.

Noise associated with compressor station operation is described in Sections 3.14 and 4.14.

Produced Water Disposal Facilities

Based on the production characteristics of water from the current 89 production wells in the Project Area, peak water production from the entire field of up to 698 wells would not exceed 107,000 BWPD (13.8 ac-ft/day) at any point in time or for any number of wells for the approximately 30-year life of project. The water contains roughly 6,500 - 9,000 milligrams per liter (mg/L) TDS, including roughly 3,500 mg/L of bicarbonate and 1,500 mg/L of chloride. Produced water would be introduced directly into the water flowlines gathering system (Figure 2.2-1). Produced water would be disposed by injection wells and evaporation from adjacent evaporation ponds. Disposal of produced water would be in accordance with a plan approved by the BLM as provided for in Onshore Oil and Gas Order No. 7, Disposal of Ground Water, and the

Underground Injection Control (UIC) permit program administered by UDOGM.

For the purposes of analysis, it is anticipated that seven injection well facilities would be drilled, constructed, and operated in addition to the single existing injection well facility currently operating in the Project Area (SW 1/4 of Section 31, T14S, R10E), and seven produced water evaporation ponds would be constructed and operated for the life of the project in addition to the existing evaporation pond in Section 1, T15S, R9E of the Project Area (Plate 2).

Approximate proposed locations of the injection well facilities and ponds are as follows (Plate 2):

NW 1/4 of Section 16, T14S, R8E
NE 1/4 of Section 3, T14S, R9E
SE 1/4 of Section 19, T14S, R9E
SW 1/4 of Section 31, T14S, R9E (existing injection well)
W 1/2 of Section 17, T15S, R10E
SE 1/4 of Section 2, T16S, R9E
SW 1/4 of Section 28, T16S, R9E
W 1/2 of Section 1, T15S, R96 (existing evaporation pond)

Since operation began at the existing injection in August 1994, the well has disposed produced water in the Navajo Formation at an average rate of 6,368 BWPD for the period August, 1994 through November, 1995. Since stimulation of the well in November, 1995, the average rate of injection has been 6,559 BWPD at approximately 750 pounds per square inch (psi). The seven proposed injection wells would be completed into the Navajo, Entrada, Wingate, and Curtis formations. Based on experience with rates of injection into the Navajo Formation and the thickness, porosity, and permeability modeling conducted by RGC for all of the formations, the proposed injection wells should handle 10,000 BWPD (1.3 ac-ft/day).

The seven produced water evaporation ponds would be constructed adjacent to the proposed injection well locations. Each pond would have dimensions of approximately 400 feet by 400 feet by 9 feet deep. The surface area of a pond would be approximately four acres and the volume approximately 33 ac-ft. Each pond would employ an active spray process to enhance evaporation to an annualized daily minimum average of 5,000 BWPD (0.6 ac-ft/day). This evaporation rate is based on pond size, volumes of water sprayed, and a nozzle manufacturer's test (10 percent evaporation factor). Each pond would be constructed with a liner and leak detection system. During normal operation, each pond would have 7 feet of freeboard and contain 156,700 barrels (20 ac-ft) of water. The ponds would be managed such that there would be a minimum freeboard at all times of 2 feet. Each evaporation pond would have a sloped floor. A pipeline would be connected to the bottom of the pond at the deep end to facilitate removal of concentrated water and transfer of this concentrate to an injection well for disposal. The evaporation pond would be surrounded by a six-foot chain link fence with one foot of barbed wire on top. The existing evaporation pond is 500 feet by 1,000 feet in dimension (13 acres), and was used by RGC as a pilot project to assess spray technology and size requirements for the proposed new evaporation ponds.

Based on a projected injection rate of 10,000 BWPD, the seven proposed injection wells would have a capacity to dispose 70,000 BWPD (9 ac-ft/day). The existing injection well completed into the Navajo Formation would add only another 6,000 BWPD (0.8 ac-ft/day) capacity to the project for a total injection capacity of 76,000 BWPD (9.8 ac-ft/day). Operation of the 7 proposed spray-

evaporation ponds would add an additional water disposal capacity of 35,000 BWPD (4.5 ac-ft/day) to the 15,000 BWPD (1.9 ac-ft/day) disposal capacity of the existing evaporation pond for a total of 50,000 BWPD (6.4 ac-ft/day).

Based on an accepted approach for forecasting water production (zero-time plot based on actual production from the Drunkards Wash Unit), production from 698 wells on a daily basis under the Proposed Action would yield approximately 107,000 BWPD (13.8 acre-feet/day). Appendix 2E contains graphs showing water production projections associated with each alternative.

The projected disposal capacity for produced water would total 126,000 BWPD (16.2 ac-ft/day), 19,000 BWPD (2.4 ac-ft/day) more than peak water production. If the capacity of the water disposal system is exceeded during field development, RGC would follow the appropriate procedures (UDOGM and Onshore Oil and Gas Order 7) to have the additional Class II injection wells approved and drilled and/or to construct additional evaporation ponds. Water production and disposal requirements would decline after the peak.

Construction and installation of an injection well facility would require activities similar to those for the construction, drilling, completion, and installation of a production well (Tables 2.2-9 and Appendix 2B). One exception is that both drilling and casing installation would likely require an additional two days each per well due to the greater depths in which the well would be completed. An access road (produced water pipeline), and electrical distribution line would be constructed as part of a transportation corridor into the injection well facility. Construction of each injection well facility would require the sand/gravel surfacing of approximately one-half (4 acres) of the 8-acre facility. Disturbance from the injection well facility would total approximately 8 acres. Installed features of the injection well facility would include the well, electricity-powered injection pump, and six 210-barrel water storage tanks, separator, and a collection pond (Figure 2.2-5). Two 250-watt lights would be installed on poles (directed downward) to illuminate key areas.

Construction of a produced water evaporation pond would require a work crew of five approximately 20 days to excavate and line (impermeable liner) a 400 feet by 400 feet by 9 feet deep impoundment (Table 2.2-9). Again, two 250-watt lights would be installed on poles (directed downward) to illuminate key areas. A disturbance area of approximately four acres would be created by the excavation and placement of excavated soil in berms.

Maintenance and Workover Operations

Routine production operations within the Project Area would occur on a year-long basis or as ground and site conditions permit. Operations would require use and maintenance of access roads and wellpads on a periodic, as-needed basis. Summer (late spring to early fall) maintenance would typically require gravel additions and/or blading consistent with graveled road maintenance operations in the area. Winter (late fall to early spring) maintenance would include blading of snow from access roads and facilities and some summer-like maintenance activities as necessary. RGC would maintain all project-related roads except pre-existing county roads and roads taken over by landowners at abandonment. Maintenance of the various mechanical components of CBM gas production would occur at intervals recommended by manufacturers, or as needed based on telemetry and on-site visits.

A pumper would visit each producing well on average once every three days to ensure that equipment is functioning properly. These efforts would be supplemented by a central off-site computer-based automation system which would allow monitoring of operations at each well. This system would monitor various operating conditions (such as gas and water production rates, pipeline pressure, separator pressure, etc.) to determine if abnormal conditions exist. The wellsite automation equipment power source is electricity provided by underground cable laid to the well site. The wellsite operating conditions are transmitted to RGC's Price operating center office. If a problem is identified maintenance personnel could be dispatched immediately. The combined efforts of the on-site visits by pumpers and the automation system allow for operations to be monitored continuously to expeditiously remedy any potential problem.

The computerized monitoring and control equipment would receive commands and information via radio signals. Production engineers would be able to control certain well parameters from computer terminals at the RGC office in Price. The radio controlled system would allow real-time signals and solutions in response to well production problems. Control and monitoring of well production by radio telemetry would reduce regular site inspections of each well and vehicular traffic to approximately once every three days.

Full-time RGC employees located at the operations office in Price would increase from a current figure of approximately 10 individuals to about 50 after approximately 10 years and full development of RGC's CBM gas field. An increase of about five persons per year is anticipated.

Periodically, a workover on the well may be required. A workover uses a unit, similar to a completion rig, to ensure that the well is maintained in good condition and that it is capable of delivering production from the formation as efficiently as possible. Workovers can include repairs to the wellbore equipment (casing, tubing, rods, or pump), the wellhead, or the production formation itself. These workovers may require venting pressure relief, generating brief periods of noise. These repairs occur during daylight hours only and are usually completed in one day. There may be some limited situations that require several days to finish a workover. The frequency for this type of work cannot be accurately projected since workovers vary well by well, depending on the circumstances. One workover per year per well is anticipated for purposes of the EIS analysis.

Chemical Use and Management

The Proposed Action would use a variety of chemicals including solvents, lubricants, paints, and additives. Table 2.2-11 presents a list of chemicals proposed for use during well field development based on current CBM development requirements in the Project Area. The table identifies the chemical, whether or not the substance is stored in the field or at the warehouse in Price, the amount stored if applicable, and the chemical's common application. None of the chemicals proposed for use meet the criteria for a hazardous material/substance and the quantities criteria per BLM Instruction Memorandum No. 93-344.

Solid Waste Sources and Controls

The Proposed Action would produce a variety of waste, including drilling solids, steel drums, waste oils, spent oil filters, waste parts,

cleaning solvents, spent water filters, waste triethylene glycol and spent glycol filters.

Drilling solids or cuttings would be produced. The cuttings are the bits of waste rock produced by the drill bit cutting through the Mancos shale interval commencing 3 to 4 feet from surface and ending at the top of the Ferron formation (target zone). The solids would be buried in the drilling pit after the drilling fluids are evaporated.

Emptied steel and plastic drums which held materials such as caustic soda, citric acid, lubricating oil, methanol, and drilling additives would require disposal. Empty metal or plastic drums would be returned to the supplier of the product (RGC would rent drums and should thereafter be able to return such drums to suppliers for refill only).

Waste lubricating oil generated at the compressor stations and production sites would be disposed by a third party contractor. RGC is currently using Indian Oil Company in Linden, Utah, but may use other contractors in the future. Some fluids would be generated at the compressor station during pipeline cleaning operations, referred to as pigging. Such fluid would be stored in a 200-barrel aboveground tank. The tank's contents would be removed by a contractor using a vacuum truck and transported to a permitted disposal/recycling site.

Each compressor station would create an additional oil waste product through the by-pass function. This waste is a combination of about 90 percent water and 10 percent light hydrocarbon. This compressor by-pass fluid would be piped to the 200-barrel storage tanks as discussed above.

Waste lubricating oil to be produced at the production sites would be minimal because electric motors are planned for development. Oil in the gearboxes would be changed about every three years, as appropriate, based on analysis of the oil.

Solid wastes generated at the compressor stations would include spent gas filters and cleaning rags, which would be handled as general trash and sent to the regional landfill. Spent oil filters from the compressor lubrication systems would be removed and disposed in an approved disposal site or facility, such as Indian Oil Company.

Several waste streams would be generated from the triethylene glycol dehydration line located at the compressor stations. The dehydration systems remove entrained water from the natural gas by contacting the gas with triethylene glycol. The glycol would be regenerated through the application of heat. The water would be "boiled off" and released as steam.

As necessary, triethylene glycol would be replaced due to the excessive accumulation of contaminants. An approved contractor would remove the spent glycol and replace fresh triethylene glycol in the system. However, on occasion, RGC may remove the spent glycol and temporarily store this glycol in drums on site. As required by appropriate regulations, an approved contractor would remove and properly dispose of the spent glycol.

In addition to the spent glycol, spent sock and charcoal filters would also be used in dehydration. Sock and charcoal filters would be removed from each unit approximately once every two months and be placed in the general trash for ultimate disposal.

2.2.4 Final Reclamation and Abandonment

The Proposed Action contemplates that each well would be produced through its economic life (RGC assumes for internal planning purposes that this would be approximately 20 years). RGC would reclaim and revegetate each of its facilities in accordance with accepted procedures as outlined in Section 2.2.5.

While subject to revision in accordance with appropriate standards, current reclamation plans are as follow:

- All surface equipment would be removed and either refurbished for installation at other RGC facilities or sold. -
- Dry holes and depleted producers would be abandoned in accordance with Onshore Oil and Gas Order No. 2.
- Wellsites would be plowed and seeded with native vegetation selected in coordination with the landowner and/or land manager of each location. BLM seed mixes are provided in Appendix 2F.
- Pipelines would be abandoned in place to avoid renewed surface disturbance.
- Subsurface power lines would be abandoned in place.
- Access roads would be reclaimed by plowing and seeding unless the landowner and/or land manager wishes to make use of any roads and accept responsibility for future road maintenance.

Reclamation plans outlined above would apply to the Proposed Action and all alternatives. In addition to these proposed measure, additional environmental protection measures proposed by RGC (committed), and required by the BLM and state agencies are presented below in Section 2.2.5.

2.2.5 Environmental Protection Measures

2.2.5.1 <u>River Gas Corporation Committed Measures</u>

RGC proposes to implement mitigation measures, design features, and procedures throughout the Project Area to avoid or minimize adverse effects to the human and natural environment. Many of these are described under the Proposed Action, and are included by reference as environmental protection measures. In addition to those design and construction procedures and features discussed in Sections 2.2.2 to 2.2.4, and compliance with all applicable environmental laws and regulations (Table 1.5-1), RGC would implement the following additional protective measures. These environmental protection measures would be applied as standard operating procedures and used on all lands, including federal, state, and private.

RGC 1 RGC would use magnesium chloride for dust suppression on roads during project operation.

RGC 2 RGC wells would be cased and cemented from surface to bottom, to prevent water migration up the well bore.

RGC 3 RGC would have a program in place involving three techniques to detect leaks: (i) material

balance, (ii) pressure maintenance through its computerized automation system (in the event of a pressure drop, the well is shut in automatically), and (iii) annual survey of pipelines with leak detection equipment. In the event of a pipeline leak, the exact location is detected by either gas detection equipment or visible trace of water. The appropriate part of the field is then shut-in, and the pipeline is shut down and repaired as soon as possible.

RGC 4 Ground disturbance in agricultural areas with spreader-dike or contour furrow systems would be avoided, where possible. In areas where these systems are dissected by roads or well locations, affected dikes and furrows would be restored to pre-disturbance conditions.

RGC 5 RGC would site roads and well locations in coordination with BLM, UDWR, and other landowners.

RGC 6 Roads not required for routine operation and maintenance of producing wells and ancillary facilities, and disturbed areas associated with permanently plugged and abandoned wells, would be permanently blocked, recontoured, reclaimed, and revegetated by RGC, consistent with the requirements of BLM and state landowners. For private lands, RGC would turn the road over to the private landowner or reclaim it according to the terms of any surface use agreement that may then be in effect. Roads not required by BLM, State of Utah, or landowners for open access would be gated and locked to limit access per federal, state, and/or private ownership requirements.

RGC 7 RGC would reclaim disturbed areas, and would reseed using seed mixtures identified by BLM, UDWR, or other landowners.

RGC 8 RGC would train its employees with respect to noxious weed identification, and make arrangements for weed control upon positive identification of noxious weeds at its facilities.

RGC 9 RGC would comply with the Utah Noxious Weed Act and require contractors to clean equipment before bringing it to the project vicinity so as to prevent introduction and spread of noxious weeds.

RGC 10 RGC would not allow firearms or pets to be brought into the Project Area by employees or contractors during project work.

RGC 11 RGC would not allow harassment of wildlife by employees or contractors, and would arrange for training of its employees and contractors on this issue.

RGC 12 RGC would enforce adherence to speed limits by its employees and contractors while working on the project.

RGC 13 RGC would use a remote monitoring system that would limit the number of routine maintenance visits to wells.

RGC 14 RGC would maintain a seasonal restriction on construction within 1/2 mile of active raptor nests during the active nesting period, unless circumstances indicate that such a limitation would not be necessary or if such limitation would not be applicable under existing laws, regulations or lease rights. (This environmental protection measure is superseded on federal land by BLM 40).

RGC 15 RGC would make every effort to complete drilling before the beginning of November on big game critical winter range, to reduce the potential for disturbance to wintering big game. While RGC plans to finish drilling in these areas by October, drilling lease schedules are, to some extent, beyond their control and their obligation as lessee to diligently develop the resource may necessitate the continuance of drilling into November or December. (This environmental protection measure is superseded on federal lands by BLM 37).

RGC 16 RGC would paint all facilities they install to blend in with the surrounding landscape, except where safety concerns (such as manhole barriers) or equipment operations (such as portions of the compressors) do not allow this.

RGC 17 Existing range and livestock facilities, such as fences, corrals, wells, reservoirs, water pipelines, and water troughs would not be disturbed without prior notification and approval of the landowner. Where it is necessary to gain access across a fenceline for construction or operation purposes, a cattleguard or gate would be installed and the fence braced on each side of the gateway.

RGC 18 RGC would educate work crews as to the sensitivity of cultural resources, the protection they are afforded, and their responsibilities to avoid disturbance to sites and report any discoveries during construction activities.

2.2.5.2 BLM Required Environmental Protection Measures

BLM environmental protection measures would be required on lands with federal surface ownership, and on lands with federal oil and gas mineral ownership. The list of BLM-required environmental protection measures has been assembled from the following relevant BLM regulations, guidelines and other documents:

- BLM surface operating standards for oil and gas exploration and development (USDI, BLM 1989)
- Regulations governing onshore oil and gas operations (43CFR Part 3160), including Notices to Lessees and Onshore Oil and Gas Orders
- BLM standard lease stipulations and leasing categories

- BLM Price River Resource Area Management Framework Plan (USDI, BLM 1984a)
- BLM's San Rafael Resource Management Plan (USDI, BLM 1988c)
- BLM Price River Resource Area Management Framework Plan Supplement on the Designation of Hydrocarbon Lease Categories Outside Special Tar Sands Areas (USDI, BLM 1984b)
- BLM Environmental Assessment Supplement on Cumulative Impacts on Oil and Gas Categories (USDI, BLM 1988a). This document includes a list of standard operating procedures for oil and gas operations.
- BLM road construction standards (Appendix 2D)

Environmental protection measures would be implemented for individual wells as part of the BLM's review of APDs, and attached SUPO and Drilling Program. Examples of the SUPO and Drilling Program are provided in Appendix 2B.

Standard lease terms provide for reasonable measures to minimize adverse impacts to surface resources. The BLM's surface use rights in 43 CFR Part 3101.1-2 state, "A lessee shall have the right to use so much of the leased lands as is necessary to explore for, drill for, mine, extract, remove and dispose of all the leased resource in a leasehold subject to: stipulations attached to the lease; restrictions deriving from specific nondiscretionary statutes; and such reasonable measures as may be required by the authorized officer to minimize adverse impacts to other resource values, land uses or users not addressed in the lease stipulations at the time operations are proposed. To the extent consistent with lease rights granted, such reasonable measures may include, but are not limited to, modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures. At a minimum, measures shall be deemed consistent with lease rights granted provided that they do not: require relocation of proposed operations by more than 200 meters; require that operations be sited off the leasehold; or prohibit new surface disturbing operations for a period in excess of 60 days in any lease year."

Measures inconsistent with these terms cannot be required absent a lease stipulation, unless it is determined that such mitigation is required to prevent unnecessary and undue degradation of public lands or resources. The clear evidence and convincing need for such mitigation must be documented in a site-specific EA or EIS, if necessary, on the APD.

Operations must be conducted in a manner that minimizes adverse impacts to the land, air, water, cultural, biological, and visual elements of the environment, as well as other land uses or users. Federal environmental protection laws such as the Clean Water Act, Endangered Species Act, and Historic Preservation Act, would be applied to all lands and are included in the standard lease stipulations. If threatened or endangered species, objects of historic, cultural, or scientific value, or substantial unanticipated environmental effects are encountered during construction, all work affecting the resource would stop and the land management agency would be contacted. Surface-disturbing operations that would destroy or harm these species or objects are prohibited.

The environmental protection measures listed below may be waived on a case by case basis as determined by the BLM or other surface owner.

Location of Facilities and Timing of Construction

BLM1 Final well locations and transportation corridor alignments would be selected and designed to avoid or minimize disturbances to sensitive areas, including areas of high wildlife value or critical habitat, grazing, and/or recreational value, including wetlands and riparian areas; and areas with high erosion potential, highly saline soils, rugged topography, and/or poor reclamation potential (i.e., steep slopes, eroded lands, floodplains, unstable soils), where possible.

BLM2 New roads would be constructed so as to avoid areas with high erosion potential. Where roads must be allowed, new roads would be graded to spread drainage instead of channeling runoff. No road grades in excess of 15 percent would be allowed on slopes greater than 15 percent. No vehicle access would be allowed across slopes in excess of 25 percent.

BLM3 Construction would not occur on frozen or saturated soils, or when watershed damage is likely, unless an adequate plan is submitted to the BLM that demonstrates potential impacts would be mitigated. BLM may limit cross-country travel or construction activity at times when soils are dry or frozen or have snow cover. BLM would determine what is "wet," "muddy," or "frozen" based on weather and field conditions at the time. The limitation does not apply to maintenance and operation of producing wells.

BLM4 Occupancy or other surface disturbance would not be allowed within 330 feet of the centerline or within the 100-year recurrence interval floodplain of perennial streams, except where authorized in writing by the BLM (e.g., road crossings).

BLM5 Occupancy or other surface disturbance would not be allowed within 660 feet of springs, whether flowing or not. No vibroseis, drilling or blasting would be allowed within 0.25 mile of any spring or water well.

BLM6 During project construction, surface disturbance and vehicle travel would be limited to the approved location and access routes. Any additional area needed must be approved by BLM prior to use.

BLM7 Vegetation removal necessitated by a construction project would be confined to the limits of actual construction. Removed vegetation will be stockpiled for use in reclamation or removed from the construction site at the direction of the BLM.

Reclamation

A reclamation plan would be a part of the surface use plan of operations. The following are generally components of the reclamation plan:

BLM8 All pits must be reclaimed to a natural condition similar to the rest of the reclaimed area, and must be restored to a safe and stable condition.

BLM9 Reclamation would start immediately upon completion of construction, unless prevented by weather conditions. Disturbed areas would be restored to approximately the original contour.

BLM10 Disturbed areas would be revegetated after the site has been satisfactorily prepared. Site preparation may include ripping, contour furrowing, terracing, reduction of steep cut and fill slopes, waterbarring, or other procedures.

BLM11 Revegetation seed mixes have been established by BLM for the Project Area, and are provided in Appendix 2F. They are based on erosion control, forage production, elevation, soils, vegetation community composition, and precipitation requirements. Different seed mixes have been developed for temporary seedlings, and for final reclamation of sites in salt desert, sagebrush/grass, pinyon-juniper, mountain brush, and riparian habitats. Reclamation in riparian habitat would also involve sedge and rush root plugs, willow cuttings, and cottonwood bare root stock plantings. All seed mixes would be free of noxious weeds.

BLM12 Seeding would be done by drilling on the contour whenever practical, or by other approved method. Where broadcast seeding is used, seeding would take place after the soil surface is recontoured and scarified. A harrow or similar implement would be dragged over the area to assure seed cover.

BLM13 On all cut slopes, the seeding must extend from the bottom of the ditch to the top of the cut slope. On embankment slopes, the seeding must extend from the roadway shoulder to the toe of the slope. Seeding would also be done on all borrow pit areas and on all sidecast slopes in areas of full bench construction.

BLM14 Seeding and/or planting would be repeated until satisfactory revegetation is accomplished, as determined by BLM. Mulching, fertilizing, fencing or other practices may be required.

BLM15 Seeding would be done from October 1 to November 15, and from February 1 to March 31.

BLM16 Sufficient topsoil to facilitate revegetation would be segregated from subsoils during all construction operations and would be returned to the surface upon

completion of operations, where feasible. Topsoil stockpiles would be revegetated or otherwise protected to prevent erosion and maintain some soil microflora and microfauna. Stockpiled topsoil would be spread evenly over the recontoured area. All disturbed areas and vehicle tracks from overland access would be ripped 4 to 12 inches deep within the contour.

BLM17 Bonds are required for oil and gas operations on federal leases for protection of the environment, including surface reclamation. Revegetation must be successfully established for release of the bond.

BLM18 Reclamation and abandonment of pipelines and flowlines may require replacing fill in the original cuts, reducing and grading cut and fill slopes to conform to the adjacent terrain, replacement of surface soil material, waterbarring, and revegetating in accordance with a reclamation plan.

BLM19 Well-site reclamation would include recontouring to re-establish natural contours where desirable and practical.

BLM20 After well plugging and abandonment, roads not required for the BLM transportation system would be closed and obliterated. Reclamation may include ripping, scarifying, waterbarring, and barricading. Stockpiled soil, debris and fill materials would be replaced on the roadbed to conform to the approved reclamation plan.

BLM21 Water bars would be constructed on road grades or slopes, if required by BLM. Spacing of waterbreaks is dependent on slope and soil type. For most soil types, the following spacings would be used:

Slope	Spacing
2%	200 feet
2-4%	100 feet
4-5%	75 feet
>5%	50 feet

BLM22 Revegetation on big game critical winter range would include hand-planting of seedling browse plants and use of seedling protectors to provide protection against browsing in the first two years after planting.

BLM23 Temporary erosion control measures such as mulch, jute netting, or other appropriate methods would be used on unstable soils, steep slopes, and wetland areas to prevent erosion and sedimentation until vegetation becomes established.

<u>General Requirements</u>

BLM24 Precautions must be taken at all times to prevent wildfire. Operators would be held responsible for suppression costs for any fires on public lands caused by operator's negligence. No burning of debris would be

allowed without specific authorization from BLM.

BLM25 Any campfires must be kept to a minimum size and utilize only downed dead wood.

BLM26 Road construction must meet BLM class III standards (Appendix 2D).

BLM27 With BLM approval, existing roads or trails may be improved (bladed) if impassable by vehicles or equipment. No widening or realignment would be allowed unless approved by BLM.

BLM28 - New trails may be constructed only when vehicle and equipment passage is impossible, and only with the concurrence of the BLM. Any pushed trees are to be readily retrievable without additional disturbance, if needed for reclamation.

BLM29 Reserve pits for oil and gas drilling operations may be required to be lined with commercial-grade bentonite or plastic liners sufficient to prevent seepage. At least half of the capacity would be in a cut.

BLM30 Prior to the use of insecticides, herbicides, fungicides, rodenticides, and other similar substances, an operator must obtain from BLM approval of a written plan. The plan must describe the type and quantity of material to be used, the pest to be controlled, the method of application, the location for storage and disposal of containers, and other information that BLM may require. A pesticide may be used only in accordance with its registered uses and within other agency limitations. Pesticides must not be permanently stored on public lands.

Water Resources

BLM31 Existing fords would be used for drainage crossings where possible. Low-water crossings would use a cut-and-fill process or upgrade existing crossings unless use of culverts is specifically authorized.

BLM32 Bridges and culverts would allow adequate fish passage where applicable. Take-down (or free-floating) panels or water gates would be installed on all fences that cross intermittent or perennial stream channels.

BLM33 For construction projects lasting more than 30 days, portable chemical toilets would be provided at all staging areas, bases of operations, and storage areas.

BLM34 Soaps, detergents, or other nondegradable foreign substances would not be used for washing in streams or rivers. Biodegradable soap may be used.

BLM35 No oil, lubricants, or toxic substances may be drained onto the ground surface. Pads would be designed so that any oil,

lubricants, etc., would drain into a collection system.

Wetlands and Riparian Areas

BLM36 Construction, development, and rights-of-way in riparian areas would be minimized. Where these areas must be disturbed, stipulations would minimize impacts and require post-disturbance reclamation. Reclamation would be closely monitored, and not considered complete until the desired vegetation is established.

Wildlife

BLM37 Exploration, drilling and other development would be allowed only during the period May 16 through October 31 in elk, mule deer, or moose winter range. This limitation does not apply to maintenance and operation of producing wells. Exceptions to this limitation in any year may be specifically authorized in writing by the Authorized Officer of the BLM.

BLM38 Where disturbance exceeds 10 acres in elk, mule deer or moose critical winter range, an equivalent acreage of adjacent habitat would be upgraded to accommodate increased use, and is to be completed commensurate with surface disturbing activity.

BLM39 Exploration, drilling or other development activity would only be allowed from June 16 to March 31 in sage grouse strutting/nesting areas. This limitation does not apply to maintenance and operation of producing wells.

BLM40 Permanent surface disturbance and occupancy (i.e., oil and gas production facilities) is prohibited within 0.5 miles of raptor nests which have been documented as occupied within a 3-year period, and temporary surface disturbance and occupancy (i.e., seismic lines, oil and gas exploration, road construction) is prohibited within one-half mile buffer zones during the critical nesting period. Site-specific evaluations in coordination with the USFWS may allow for modifications to this requirement. This requirement does not apply to maintenance and operation of producing wells and access roads.

BLM41 Raptor surveys would be required to determine the status of known nests and verify presence of additional nests for all federal leases within the Project Area. Surveys would be conducted by consultants qualified to conduct such surveys and approved by the authorized officer. All surveys would be conducted by helicopter during May of each year, prior to the proposed year for drilling and prior to APD approval. Costs for surveys and preparation of a report of the findings of the survey would be the obligation of the proponent.

Cultural Resources

BLM42 All areas subject to surface disturbance, or Areas of Potential Concern, which have not been previously inventoried for cultural resources to BLM standards, must be inventoried prior to approval of an APD or other actions. The Area of Potential Effect (APE) is defined as any area that may be subject to direct or indirect impacts to cultural resources by elements of the development project. The zone of the APE would vary in size in accordance with the projected levels of sensitivity for cultural resources at the location of any development. In low sensitivity areas, the APE would be defined as the area subject to direct impacts through surface disturbing activities. In areas of medium sensitivity, the APE would be expanded to account for potential indirect impacts: intensive inventory would occur on all well pads plus an additional 10 acres surrounding each pad; a 150-foot corridor centered on roads, flowlines, and other facilities would be inventoried as the APE. In high sensitivity areas, the APE would include the well pad and 10 acres surrounding the well location; and the APE for roads, flowlines, and other facilities would be the area of direct ground disturbance and a 300-foot zone on all sides of the facility.

Cultural resource inventories would be conducted in accordance with BLM Manual 8100 by authorized cultural resource professionals. Prior to field work, a records check must be conducted to identify previous inventories and recorded properties. During the course of inventories, previously unrecorded sites must be recorded on standard BLM forms, photographed, and mapped. Cultural resources would be evaluated, and a recommendation on eligibility to the National Register of Historic Places would be made. BLM would make all Determinations of Eligibility. A report would be prepared for each development or series of developments documenting the inventory methods, results, description of the sites within the APE, recommendations on National Register eligibility, and would include proposed mitigating measures

The BLM would consult with the State Historic Preservation Officer (SHPO) and the President's Advisory Council on Historic Preservation (ACHP) as mandated by the National Historic Preservation Act of 1966 (as amended), in accordance with guidelines set forth in a Programmatic Agreement among BLM, SHPO, ACHP and RGC. This document is in preparation and would be completed as a legally binding agreement prior to issuance of a Record of Decision for the overall project. Site avoidance, detailed site

recordation, and site protection would be the preferred treatments, but mitigation of National Register eligible properties through data recovery may take place where avoidance is not prudent or feasible, after consultation as specified in the Programmatic Agreement. BLM would submit a treatment plan to SHPO, ACHP and to other affected parties as may be appropriate for a 30-day consultation prior to implementation of data recovery efforts.

BLM43 BLM would notify, consult, and/or coordinate with Indian tribes, traditional leaders, and other interested parties as required by various statutes (NEPA, American Indian Religious Freedom Act [AIRFA], National Historic Preservation Act [NHPA], Federal Land Policy and Management Act [FLPMA], Archaeological Resources Protection Act [ARPA], and the Native American Graves Protection Act [NAGPRA]). In particular, BLM would attempt to elicit information concerning the potential effects of any action resulting from the Proposed Action on traditional cultural properties, including areas of traditional use and areas of religious or cultural importance to tribes. Indian tribes would be afforded a minimum of 30 days for review, comment, and consultation prior to issuance of a decision; under certain circumstances additional time must be afforded. A 30-day notification period is required by ARPA prior to issuance of any Cultural Resource Use Permits for the excavation and removal of cultural resources from public lands administered by BLM. NAGPRA requires notification and consultation with affected tribes regarding the potential to encounter human remains during the course of a project, and provides for cessation of work, and the notification and consultation with tribes, should inadvertent discovery of human remains occur during the course of a project. BLM would assure adherence to these statutes.

BLM44 If a previously unknown property is encountered during construction or operation of the facilities, or if a previously planned undertaking would affect a known historic property in an unanticipated manner, all work that might adversely affect the property would cease until the BLM can evaluate the significance of the property and assess the effect of the undertaking. The BLM would consult with the SHPO on both a determination of eligibility and the assessment of effect in an expeditious manner. If the site is determined eligible and would be affected by the undertaking, the BLM would ensure that RGC prepares an avoidance or treatment plan for the property.

BLM45 If human remains are discovered at any point during the project, they would be treated according to state and federal law, and according to the wishes of concerned Native American tribes, pursuant to the Native American Graves Protection and Repatriation Act. The county sheriff, coroner, land-managing official, and State Archaeologist shall be notified. The remains shall not be disturbed until the appropriate officials have examined them.

Land Use

BLM46 - On split estate lands, where the surface is privately owned and the subsurface is federally owned, it is the policy of BLM to apply the same environmental protection standards as would be used for federal surface. These standards have been set forth as BLM Required Environmental Protection Measures BLM1 through 56. The operator is responsible for reaching an agreement with the private surface owner which considers the recommended BLM protection measures and formalizes requirements for the protection of surface resources and/or damages.

The BLM may request submission of the private agreement for the proposed well site or access road on federal mineral estate. If the agreement does not adequately protect surface values or adjacent federal lands, BLM may impose additional protective measures, while considering the needs and desires of the private surface owner.

Each application for permit to drill or application to conduct other surface disturbing activities shall contain the name, address and telephone number of the surface owner. The BLM would invite the surface owner to participate in any on-site inspection that is held. The operator is responsible for making access arrangements with the private surface owner prior to entry.

BLM47 Incorporated cities are categorized by BLM as No Lease. Within the Project Area, BLM leases do not permit surface occupancy or other activity for Carbon County Airport, Carbon County Recreation Complex, and Carbon County sanitary landfill.

Livestock Management

BLM48 Existing range and livestock management facilities, such as fences, wells, reservoirs, watering pipelines, troughs, and trailing systems, would not be disturbed without prior approval of BLM. Where disturbance is necessary, the facility would be returned to its original condition.

BLM49 Newly constructed range improvements such as fences and reservoirs must meet BLM standards. When it is necessary to

gain access across a fenceline for construction purposes, the fence must be braced. Four-inch timber or equivalent must be installed and the gateway kept closed when not in actual use.

BLM50 All gates found closed during the course of the operation must be reclosed after each passage of equipment and personnel. Cattle guards would be installed in fences on all collector roads. Either a cattleguard or a gate would be required on local and resource roads to control livestock movement or vehicular access.

BLM51 If road construction cuts through natural topography that serves as a livestock barrier, a fence would be constructed to replace it. The fence would be installed with a cattle guard or gate to control livestock and vehicle movement or access.

BLM52 Access to grazing areas would be maintained at all times. Livestock operators would have access to grazing areas where road closures are implemented.

Visual Resources

BLM53 Roads through timbered areas would take a curvilinear path to reduce sight distances.

BLM54 Upon completion of the project, the area and access roads would be reclaimed to as near the original condition as possible. All disturbed areas would be recontoured to blend as nearly as possible with the natural topography. All berms would be removed and all cuts (including roads) filled.

BLM55 Construction areas and access roads would be kept litter-free. The operator must provide a trash pit or trash cage, and trash must be collected and contained during the operation. All garbage, trash, flagging, lath, etc., would be removed from the area and hauled to an authorized dump site.

BLM56 Construction and facilities would be in conformance with Visual Resource Management objectives for the VRM classes on the Project Area. All surface facilities in the Project Area would be located to minimize disturbance of the visual horizon and painted to blend in with the surrounding landscape. Colors would be specified by BLM.

2.2.5.3 State of Utah

Measures Applicable to All Lands

The Utah Division of Oil, Gas and Mining regulates oil and gas activities on all non-federal lands within the State of Utah, under the authority of the Utah Oil and Gas Conservation Act. Required environmental protection measures are described in R649: Oil, Gas and Mining; Oil and Gas, in the Utah Administrative Code, and in the Division's Environmental Handbook: Environmental Regulations for the Oil and Gas Exploration and Production Industry (Hunt 1996). Rules with environmental implications include: requirements for bonding, casing of the well, prevention of fire hazards on the surface,

prevention of pollution, spill reporting and cleanup, inspection, on-site pre-drill evaluations which may include identification of special stipulations to be incorporated in the APD, establishment of surface use agreements with surface owners prior to commencement of well drilling, restoration of well sites after plugging and abandonment, reporting and recordkeeping requirements, pit lining, and waste disposal.

Under the Utah Noxious Weed Act, landowners are required to control state- and county-listed noxious weeds on lands under their control. If this is not done, county weed boards have the authority to perform control measures at the expense of the landowner, after notification and hearing. In addition, it is required that machinery be cleaned of noxious weed seeds before bringing it into the state; it is prohibited to sell or distribute seeds containing noxious weed seeds; and to sell or distribute hay, manure, soil, sod or nursery stock containing noxious weed seeds.

The Utah Stream Alteration Permit requires a written permit from the State Engineer to alter or change the banks of any natural stream, including utility line crossings and road construction. It does not apply if the project involves wetlands, threatened or endangered species, properties listed on the National Register of Historic Places, or channel relocations; alterations of those streams are under the jurisdiction of the U.S. Army Corps of Engineers and subject to Section 404 of the Clean Water Act. Measures used to protect water quality and related aquatic habitat would comply with the State of Utah "Nonpoint Source Management Plan for Hydrologic Modifications" (1995).

Other state permits, approvals and authorizing actions that address environmental protection are listed in Table 1.5-1.

__Utah Division of Wildlife Resources Lands__

Lands are acquired by the UDWR specifically to maintain, enhance or protect critical wildlife habitats. They are managed with the primary purpose of providing wildlife habitat. UDWR lands have been acquired using sportsmen's dollars through license sales and federal funds such as the excise taxes on hunting and fishing equipment. The Gordon Creek Wildlife Management Area (WMA) was obtained to provide big game winter range for elk and deer. The WMA is managed to provided habitat for other species as well.

While providing wildlife habitat is the primary function of UDWR lands, other uses may be allowed through ROW, lease, or special use permits. UDWR has created Rule R657-28, Use of Division Lands, to protect the Division's interests while providing for consistent and equitable treatment of requests for uses of UDWR's lands. UDWR has published Guidelines for Applying: Rights-of-way, Leases, and Special Use Permits (8/92), which would be applicable to this project. Where the operator seeks a ROW or special use permit, UDWR requires the applicant to fill out an application and provide a description of the proposed location and action. Alternatives to the Proposed Action must be identified, as well as; identification of impacts to wildlife and their habitat; identification of potential benefits to wildlife; and methods used to minimize and mitigate impacts to wildlife. In addition, UDWR requires a cultural/historic survey of the area to be affected, a survey of threatened and endangered plant and animal species and Utah wildlife species of special concern, consultation with the Natural Resource Conservation Service, and a biological assessment of all potential impacts to wildlife, its habitat, and user opportunity. The biological assessment must include the

proposed avoidance, minimization and mitigation measures incorporated into the project to reduce project impacts. Applicants are responsible for restoring all structures (fences, roads etc.), revegetating disturbed areas; development of a plan to mitigate adverse impacts to wildlife; and bearing the costs of all surveys, restoration, revegetation, and mitigation.

According to the UDWR's "Policy on Mitigating Wildlife Losses," the term mitigation includes: avoiding the impact altogether by not taking a certain action or parts of an action; minimizing impacts by limiting the degree or magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and, compensating for the impact by replacing or providing substitute resources or environments. Assessments of impact must emphasize habitat values. Every possible effort must be made to encourage the location of a proposed development or activity in an area of minimum or no impact to high interest wildlife. Compensation should, to the maximum extent possible, occur in the Project Area. However, flexibility is maintained to locate mitigation projects in other areas if no reasonable alternatives exist near the project site. Final judgments of reasonableness are made by the Director.

UDWR uses four levels to classify habitat values. The highest value is "critical habitat," which is defined as a sensitive use area that, because of limited abundance or unique qualities, constitute irreplaceable, critical requirements for high interest wildlife. The mitigation goal for "critical habitat" is no loss of existing value.

The next ranking classification is "high priority habitat." This is defined as intensive use areas that due to relatively wide distribution do not constitute critical values by which are highly important to high interest wildlife. The mitigation goals for "high priority habitat" is no net loss of in-kind habitat value, with out-of-kind compensation (trade-off) only as a last resort.

"Substantial value habitats" are existing areas used regularly by high interest wildlife but at moderate levels with little or no concentrated use. The mitigation goals for this classification is no net loss of habitat value with minimized loss of in-kind habitat values.

"Limited value habitats" are occasional use areas that either are sparsely populated or that show sporadic or unpredictable use by high interest wildlife. The mitigation goal for this classification is to minimize loss of habitat value.

UDWR requires that all impacts to wildlife habitat on UDWR lands must be mitigated. This includes direct impacts due to construction and indirect impacts due to increased human disturbance. Ways to avoid and minimize impacts are considered first, such as seasonal closures in wintering areas (generally from December 1 to April 15), nesting areas (February 15 to July 15), and fawning/calving areas (May 5 to July 5). If impacts are unavoidable, impacted habitat in critical and high priority habitats must be replaced with similar values. If enhancing currently occupied habitat, mitigation must be on a 3:1 acre basis. Habitat Evaluation Procedure (HEP) analysis and experience has shown that from three to four acres of currently occupied habitat are needed to replace lost habitat units from each acre of impacted habitat. Habitat should be replaced in-kind, and mitigation should be as close to

the Project Area as possible, and should benefit the impacted population.

Mitigation banking is an alternative that has been used to mitigate impacts from other projects. A fee is assessed that would pay for full replacement of habitat values from fragmented projects, such as a gas or oil field. This allows UDWR, or other management agency, to carry out a larger project to benefit wildlife. On UDWR lands, the fee would be set at a level to pay for habitat enhancement, project administration, and habitat acquisition if no suitable public land is available for enhancement.

UDWR would develop specific mitigation for this project after a careful review of the Proposed Action and identification of associated impacts, and after RGC's completion of the application and biological assessment required by R657-28, Use of Division Lands.

Utah School and Institutional Trust Lands

These state lands are managed to maximize the commercial gain from trust land uses, consistent with the long-term support of the beneficiaries. Rules governing the management and use of these lands is provided in Rules Governing the Management and Use of School and Institutional Trust Lands (1996).

The agency may require lessees to provide cultural, paleontological, or biological surveys for lands under mineral lease, and to be responsible for reasonable mitigative measures as required by the agency. The SITLA has standard procedures for taking into account the effect of trust land uses on sites that are included or eligible for the State Register or National Register of Historic Places (NRHP), and for allowing the SHPO a reasonable opportunity to comment.

All pits and excavations must be shaped to facilitate drainage and control erosion. The agency may require that all topsoil in the affected area be removed, stockpiled, and stabilized until the completion of operations. Upon reclamation, the stockpiled topsoil would be redistributed on the affected area and the area revegetated. All mud pits must be filled, and material and debris removed from the site at the completion of operations.

At least 60 days prior to the land disturbing operations, a plan of operations must be submitted to the agency, which would review it, make an environmental assessment, and endorse or stipulate changes in the lessee's plan of operation. An on-site visit is made at the APD stage, to locate the facilities to minimize environmental impacts while staying within the drilling window. The on-site inspection is conducted by representatives of UDOGM and RGC; representatives of UDWR and SITLA are also invited and may be present.

Bonds are required to cover costs of reclamation and other damages or costs.

2.2.5.4 Private Lands

The standard operating procedure used by RGC on private lands is to negotiate a surface use agreement with the landowner prior to starting construction, which would provide compensation for any damages. Operations and reclamation would be in accordance with the surface use agreement. In addition, RGC follows established industry practices and complies with applicable federal and state requirements.

2.3 ALTERNATIVE A - FIELD DEVELOPMENT, 80-ACRE WELL SPACING

The future performance of wells proposed in the Project Area may indicate that additional wells would be required to ensure optimal recovery of CBM gas. Additional wells would decrease the overall well spacing and increase well density. This alternative consists of 80-acre well spacing (eight per square mile), or almost twice the number of wells described in the Proposed Action. RGC would locate, drill, complete, and produce 1,103 CBM wells over the same 10-year plus period in the same 290-square mile Project Area identified under the Proposed Action (Plate 4).

Project activities as described for the Proposed Action (Section 2.2) would be essentially the same under Alternative A. However, the number of wells and the associated miles of transportation corridor (access road, pipelines, and electrical distribution lines) would increase roughly 83 percent and 48 percent, respectively, over totals for the Proposed Action (Tables 2.2-1 and 2.3-1). One thousand, one hundred and three production CBM gas wells, 514 miles of transportation corridor facilities, and 52 miles of high-pressure gathering pipeline would be developed in addition to the 97 existing wells, 58 miles of existing transportation corridor, and 2.2 miles of existing other pipeline (fresh water pipeline) (Table 2.3-1).

Wells and transportation corridor segments located within a 0.5-mile buffer area for an active raptor nest are identified in Plate 4. Numbers of affected wells and miles of affected transportation corridor are presented in Table 2.2-5.

Wells and transportation corridor segments located within winter closure areas are identified in Plate 4 and Figure 2.2-6. Locations for the gates comprising the closure system are the same as in the Proposed Action.

The number of compressor facilities and their locations would remain the same as described for the Proposed Action; however, numbers of compressor units and supporting equipment would increase for most compressor facilities (Table 2.3-2) in response to the increased number of wells and increased quantity of produced CBM gas. The six facilities would use a total of 73 compressor units. Compressor capacity would total 365 MMcf/day for Alternative A. This capacity would accommodate the estimated peak gas production of 318 MMcf/day for the total 1,200 wells operating in the Project Area, (97 existing and 1,103 proposed wells).

The number of injection well facilities and adjacent evaporation ponds would increase by 1 (to 8) compared to the Proposed Action. Based on current water production characteristics for existing wells and anticipated rates for producing wells under an 80-acre spacing scenario, water production from the entire field of up to 1,200 wells would not exceed approximately 130,800 BWPD (16.8 ac-ft/day) at any point in time or for any number of wells for the approximate 30-year life of project. Refer to Appendix 2E for a plot of the water production projection.

Under Alternative A, sand/gravel requirements for the surfacing of well pads, roads, and other facilities would total approximately 1,002,900 yds^3. A total water requirement for implementation of Alternative A, including well pad construction and surfacing, well completion and stimulation, road construction and surfacing, and an application of magnesium chloride to all roads, would be 852 ac-ft/day.

Based on a projected injection rate of 86,000 BWPD for the eight new and one existing injection well and an anticipated disposal capacity of 55,000 BWPD for the eight proposed and one existing evaporation ponds, disposal capacity of 141,000 BWPD would exceed water production by 10,000 BWPD.

Numbers of work teams, individual workers, and vehicle trips per activity would also increase approximately 80 percent over activity detailed in Tables 2.2-9 for the Proposed Action with the exception of the construction of compressor facilities, which would not differ significantly from the Proposed Action. Proposed environmental protection measures defined for the Proposed Action would also apply to Alternative A.

2.4 ALTERNATIVE B - CRITICAL AREAS AVOIDANCE

The presence of critical winter range habitat for both mule deer and elk within portions of the Project Area is the basis for these alternatives.

Alternatives B1 and B2 would preclude CBM well development in the federal mineral estate within the combined deer and elk critical winter range under either the 160-acre or the 80-acre well spacing scenarios (Plates 5 and 6). Outside of the combined Critical Area for deer and elk, project activities would essentially be the same as described for the Proposed Action - 160-acre well spacing project development, and Alternative A - 80-acre well spacing project developments.

2.4.1 Alternative B1 - 160-acre Well Spacing

Differences between the actions for Alternative B1 - 160-acre spacing scenario (Plate 5) and the Proposed Action (Plate 2) would result from the roughly 28 percent decrease in number of production wells to be drilled and the 48 percent decrease in miles of transportation corridor in comparison to the Proposed Action (Tables 2.2-3 and 2.4-1). Four hundred and thirty-six CBM gas wells, 260 miles of transportation corridor facilities, and 52 miles of high-pressure gathering pipelines would be developed in addition to the 97 existing wells, 58 miles of existing transportation corridor, and 2.2 miles of existing other pipeline (fresh water pipeline) (Tables 2.2-3 and 2.4-1).

Wells and transportation corridor segments located within a 0.5-mile buffer area for an active raptors nest are identified in Plate 5. Numbers of affected wells and miles of affected transportation corridor are presented in Table 2.2-5.

Wells and transportation corridor segments located within winter closure areas are identified in Plate 5 and Table 2.2-6. Locations for the gates comprising the closure system are the same as for the Proposed Action.

Compressor facilities and their locations would remain the same as described for the Proposed Action; however, numbers of compressor units and supporting equipment would likely decrease for several compressor facilities (Table 2.4-2) in response to the decreased number of wells and quantity of produced CBM gas. The six facilities would use a total of 50 compressor units. Compressor capacity would total 250 MMcf/day. This capacity would accommodate the estimated peak gas production of 230 MMcf/day for the total 533 wells (97 existing plus 436 proposed wells).

Based on current water production characteristics for existing wells and anticipated rates for producing wells under an 160-acre spacing scenario, water production from the field of up to 533 wells would not exceed approximately 86,500 BWPD (11.2 ac-ft/day) at any point in time or for any number of wells for the approximate 30-year life of project.

Under Alternative B1, the number of injection well facilities and adjacent evaporation ponds would each be reduced by two to five in comparison to the Proposed Action. The two injection facilities and ponds eliminated from the list of seven for the Proposed Action (Section 2.2.3.2) would be those located at NE 1/4 of Section 3, T14S, R9E and SW1/4 of Section 34, T14S, R9E on federal surface and mineral. Both injection well and evaporation pond facilities are eliminated due to their location on federal lands within the Critical Areas Avoidance area. The location of the remaining five new injection well facilities and evaporation ponds would be the same as described for the Proposed Action.

Based on a projected injection rate of 56,000 BWPD for the five new and one existing injection well and an anticipated disposal capacity of 40,000 BWPD for the five approved and one existing evaporation ponds, the six total injection well facilities and six ponds would have a disposal capacity of 96,000 BWPD. Excess capacity under Alternative B1 would total 9,500 BWPD.

Under Alternative B1, sand/gravel requirements would be about 476,338 yds^3. A total water requirement for implementation of Alternative B1, including well pad construction and surfacing, well completion and stimulation, road construction and surfacing, and an application of magnesium chloride to all roads, would be 361 acre-feet (Table 2.2-5).

Numbers of workers and vehicle trips per activity would mostly decrease approximately 50 percent from projected activities detailed in Tables 2.2-9 for the Proposed Action. Exceptions would include the construction of compressor facilities, which would not differ substantially from the Proposed Action, and the construction of injection well facilities and evaporation ponds, which would result in a roughly 30 percent decrease in worker and vehicular activity. Environmental protection measures defined for the Proposed Action would also apply to this alternative.

2.4.2 Alternative B2 - 80-acre Well Spacing

Differences between the actions for Alternative B2 - 80-acre well spacing scenario (Plate 6) and Alternative A (Plate 4) would result from the roughly 25 percent decrease in number of production wells to be drilled and the 30 percent decrease in miles of transportation corridor in comparison to Alternative A (Tables 2.3-1 and 2.4-3). Eight hundred and thirty-one CBM gas wells, 357 miles of transportation corridor facilities, and 52 miles of high-pressure gathering pipeline would be developed in addition to the 97 existing wells, 58 miles of existing transportation corridor, and 2.2 miles of existing other pipeline (fresh water pipeline) (Table 2.4-3).

Wells and transportation corridor segments located within a 0.5-mile buffer area of an active raptor nest are identified in Plate 6. Numbers of affected wells and miles of affected transportation corridor are presented in Table 2.2-5.

Wells and transportation corridor segments located within winter closure areas are identified in Plate 6 and Figure 2.2-6. Locations for the gates comprising the closure system are the same as in the Proposed Action.

Compressor facilities and their locations would remain the same as described for the Proposed Action; however, numbers of compressor units and supporting equipment would likely decrease for several compressor facilities (Table 2.4-4) in response to the decreased number of wells and quantity of produced CBM gas. The six facilities would use a total of 64 compressor units. Compressor capacity would total 320 MMcf/day. This capacity would accommodate the estimated peak gas production of 318 MMcf/day for the total 928 wells (97 existing plus 831 proposed wells).

Under Alternative B2, the number of injection well facilities would be the same (seven) as described for the Proposed Action and Alternatives A and B1. The number of evaporation ponds would be reduced by two to five in comparison to the Proposed Action and Alternative A.

Two of the locations (federal lands) for water disposal facilities would be moved outside of the Critical Areas Avoidance exclusion area. The two injection facilities and nearby evaporation ponds locations eliminated from the list of seven for the Proposed Action (Section 2.2.3.2) and Alternative A are those located at NE 1/4 of Section 3, T14S, R9E and SW 1/4 of Section 34, T14S, R9E. New locations for two injection well facilities are NE 1/4 of Section 31, T13S, R8E and NW 1/4 of Section 24, T14S, R9E (Plate 6). Locations of the remaining five new injection well facilities and adjacent evaporation ponds would be the same as described for the Proposed Action and Alternatives A and B.

Under Alternative B2, sand/gravel requirements would be about 730,151 yd^3. A total water requirement for implementation of Alternative B1, including well pad construction and surfacing, well completion and stimulation, road construction and surfacing, and an application of magnesium chloride to all roads, would be 633 acre-feet.

Based on current water production characteristics for existing wells and anticipated rates for producing wells under an 80-acre spacing scenario, water production from the field of up to 928 wells would not exceed approximately 119,359 BWPD (15.4 ac-ft/day) at any point in time or for any number of wells for the approximate 30-year life of project.

Based on a projected injection rate of 76,000 BWPD for the seven new and one existing injection well and an anticipated disposal capacity of 50,000 BWPD for the seven proposed and one existing evaporation ponds, the total water disposal capacity would be 126,000 BWPD. Excess capacity under Alternative B2 would total 6,641 BWPD.

Numbers of workers and vehicle trips per activity would mostly increase approximately 18 percent from projected activities detailed in Table 2.2-9 for the Proposed Action. Exceptions would include the construction of compressor facilities, which would not differ substantially from the Proposed Action, and the construction of injection well facilities and evaporation ponds, which would require roughly 29 percent less worker and vehicular activity. Environmental protection measures defined for the Proposed Action would also apply to this alternative.

2.5 ALTERNATIVE C - SECURITY AREAS PROTECTION

As described for Alternative B (B1 and B2) in Section 2.4, the presence of critical mule deer and elk winter range within portions of the Project Area provided the basis for this alternative. CBM well development and transportation systems construction and operation would be precluded on federal lands within specific areas within the combined mule deer and elk critical winter range. Under this alternative, areas where deer and/or elk concentrate during the winter would be established as activity avoidance areas for CBM field development under both the 160-acre and the 80-acre well spacing scenarios (Plates 7 and 8). These areas would serve as security habitat areas within the critical winter range and all surface activity would be prohibited. Outside the delineated security protection areas, project activities would essentially be the same as described for the Proposed Action - 160-acre well spacing project development and Alternative A - 80-acre well spacing project developments.

The security areas identified for protection under these alternatives were developed by BLM in consultation with UDWR. They are traditional areas of concentrated use by wintering big game, and represent the highest valued lands for big game in the Project Area. These areas were selected for protection under these alternatives in order to protect the nucleus of the herds and to enable the project to proceed while retaining the function of the critical winter range. The security areas along the Gordon Creek drainage, together with restrictions on drilling on excessive slopes and near stream corridors, would also effectively protect the integrity of the primary migration corridor for this winter range. The security areas would also provide suitable areas for mitigation of impacts (habitat enhancement) within the Project Area.

2.5.1 Alternative C1 - 160-acre Well Spacing (BLM Preferred Alternative)

Differences between the actions for Alternative C1 - 160-acre spacing scenario (Plate 7) and the Proposed Action (Plate 2) would result from the roughly 8 percent decrease in number of production wells to be drilled and the 12 percent decrease in miles of transportation corridor in comparison to the Proposed Action (Tables 2.2-3 and 2.5-1). Five hundred and fifty CBM gas wells, 308 miles of transportation corridor facilities, and 52 miles of high-pressure gathering pipeline would be developed in addition to the 97 existing wells, 58 miles of existing transportation corridor, and 2.2 miles of existing other pipeline (fresh water pipeline) (Tables 2.2-3 and 2.5-1).

Wells and transportation corridor segments located within a 0.5-mile buffer area for an active raptors nest are identified in Plate 7. Numbers of affected wells and miles of affected transportation corridor are presented in Table 2.2-5.

Wells and transportation corridor segments located within winter closure areas are identified in Plate 7 and Table 2.2-6. Locations for the gates are the same as in the Proposed Action.

Compressor facilities and their locations would remain the same as described for the Proposed Action; however, numbers of compressor units and supporting equipment would likely decrease for several compressor facilities (Table 2.5-2) in response to the decreased number of wells and quantity of produced CBM gas. The six facilities would use a total of 60 compressor units. Compressor capacity

would total 300 MMcf/day. This capacity would accommodate the estimated peak gas production of 250 MMcf/day for the total 647 wells (97 existing plus 550 proposed wells).

Under Alternative C1, sand/gravel requirements would be about 575,715 yd^3. A total water requirement for implementation of Alternative C1, including well pad construction and surfacing, well completion and stimulation, road construction and surfacing, and an application of magnesium chloride to all roads, would be 448 acre-feet.

Based on current water production characteristics for existing wells and anticipated rates for producing wells under a 160-acre spacing scenario, water production from the field of up to 647 wells would not exceed approximately 96,250 BWPD (12.4 ac-ft/day) at any point in time or for any number of wells for the approximate 30-year life of project.

The number of injection well facilities and adjacent evaporation ponds would remain as planned (7) for the Proposed Action.

Based on a projected injection rate of 76,000 BWPD for the seven new and one existing injection well and an anticipated disposal capacity of 50,000 BWPD for the seven proposed and one existing evaporation ponds, disposal capacity of 126,000 BWPD would exceed water production. Excess capacity under Alternative C1 would total 29,750 BWPD.

Numbers of workers and vehicle trips per activity would mostly decrease approximately 10 percent from projected activities detailed in Tables 2.2-9. Exceptions would include the construction of compressor facilities, injection well facilities, and evaporation ponds, which would not differ substantially from the Proposed Action, which would result in a roughly 30 percent decrease in worker and vehicular activity. Proposed environmental protection measures defined for the Proposed Action would also apply to this alternative.

2.5.2 Alternative C2 - 80-acre Well Spacing

Differences between the actions for Alternative C2 - 80-acre well spacing scenario (Plate 8) and Alternative A (Plate 4) would result from the roughly 8 percent decrease in number of production wells to be drilled and the 8 percent decrease in miles of transportation corridor in comparison to Alternative A (Tables 2.3-1 and 2.5-3). One thousand and thirteen CBM gas wells, 473 miles of transportation corridor facilities, 52 miles of high-pressure gathering pipeline would be developed in addition to the 97 existing wells, 58 miles of existing transportation corridor, and 2.2 miles of existing other pipeline (fresh water pipeline) (Tables 2.2-3 and 2.5-3).

Wells and transportation corridor segments located within a 0.5-mile buffer area for an active raptors nest are identified in Plate 8. Numbers of affected wells and miles of affected transportation corridor are presented in Table 2.2-5.

Wells and transportation corridor segments located within winter closure areas are identified in Plate 8 and Table 2.2-6. Locations for the gates are the same as in the Proposed Action.

Compressor facilities and their locations would remain the same as described for the Proposed Action; however, numbers of compressor units and supporting equipment would likely decrease for several compressor facilities (Table 2.5-4) in response to the decreased number of wells and quantity of produced

CBM gas. The six facilities would use a total of 70 compressor units. Compressor capacity would total 350 MMcf/day. This capacity would accommodate the estimated peak gas production of 346 MMcf/day for the total 1,110 wells (97 existing plus 1,013 proposed wells).

Under Alternative C2, sand/gravel requirements would be about 925,695 yds^3. A total water requirement for implementation of Alternative C2, including well pad construction and surfacing, well completion and stimulation, road construction and surfacing, and an application of magnesium chloride to all roads, would be 784 acre-feet (Table 2.2-5).

Based on current water production characteristics for existing wells and anticipated rates for producing wells under an 80-acre spacing scenario, water production from the field of up to 1,110 wells would not exceed approximately 129,500 BWPD (16.7 ac-ft/day) at any point in time or for any number of wells for the approximate 30-year life of project.

The number of proposed injection well facilities and adjacent evaporation ponds would increase by one (to 8) compared to the Proposed Action.

Based on a projected injection rate of 86,000 BWPD for eight proposed and one existing injection well and an anticipated disposal capacity of 55,000 BWPD for the eight new and one existing evaporation ponds, there would be a total disposal capacity of 141,000 BWPD. Excess capacity under Alternative C2 would total 11,500 BWPD.

Numbers of workers and vehicle trips per activity would mostly increase approximately 68 percent from projected activities detailed in Tables 2.2-9. Exceptions would include the construction of compressor facilities, injection well facilities, and evaporation ponds, which would not differ substantially from the Proposed Action. Environmental protection measures defined for the Proposed Action would also apply to Alternative C2.

2.6 NO ACTION ALTERNATIVE

Denial of well development on federal mineral estate would preclude activity on much of the federal lands within the Project Area; however, development on state and private lands would likely occur (Plate 9). Although well development would be denied, access across federal surface to reach proposed well locations on state and private lands would likely be granted by the BLM as required by BLM policy and legal precedent for access across public lands (Cotter Decision, State of Utah v. Andrus, 486 F. SUPP. 995 [D. UT. 1979]). Two hundred and twenty-eight production CBM gas wells, 154 miles of transportation corridor facilities, and 47 miles of high-pressure gathering pipeline would be developed in addition to the 97 existing wells, 58 miles of transportation corridor, and 2.2 miles of other existing pipelines (Tables 2.2-3 and 2.6-1).

Wells and transportation corridor segments located within a 0.5-mile buffer area for an active raptor nest are identified in Plate 9. Numbers of affected wells and miles of affected transportation corridor are presented in Table 2.2-5.

Compressor facilities and their locations would remain the same as described for the Proposed Action; however, numbers of compressor units and supporting equipment would likely decrease for several compressor facilities (Table 2.6-2) in response to the decreased number of wells and quantity of produced CBM gas . The six facilities would use a total of 32 compressor units. Compressor capacity would total 160 MMcf/day. This capacity

would accommodate the estimated peak gas production of 156 MMcf/day for the total 325 wells (97 existing plus 228 proposed wells).

Sand/gravel requirements would be approximately 276,658 yd^3. A total water requirement for implementation of the No Action alternative would be 198 acre-feet.

Under the No Action alternative, the number of injection well facilities and adjacent evaporation ponds would each be reduced by three to four in comparison to the Proposed Action. The three injection facilities and evaporation ponds dropped from the list of seven for the Proposed Action (Section 2.2.3.2) would be those located at NE 1/4 of Section 3, T14S, R9E; SW 1/4 of Section 34, T14S, R9E; and SW 1/4 of Section 28, T16S, R9E.

Locations of the remaining four new injection well facilities and evaporation ponds would be the same as described for the Proposed Action.

Based on current water production characteristics for existing wells and anticipated rates for producing wells under an 160-acre spacing scenario, water production from the field of up to 325 wells would not exceed approximately 58,000 BWPD (7.4 ac-ft/day) at any point in time or for any number of wells for the approximate 30-year life of project.

Based on a projected injection rate of 46,000 BWPD for the 4 new and one existing injection well and an anticipated disposal capacity of 35,000 BWPD for the four proposed and existing evaporation ponds, the five injection well facilities and five ponds would have a disposal capacity of 81,000 BWPD. Excess capacity under No Action would total 23,000 BWPD.

Numbers of workers and vehicle trips per activity would mostly decrease approximately 55 percent from projected activities detailed in Tables 2.2-9. Exceptions would include the construction of compressor facilities, which would not differ significantly from the Proposed Action, and the construction of injection well facilities and evaporation ponds, which would result in a roughly 43 percent decrease in worker and vehicular activity. Environmental protection measures defined for the Proposed Action, would also apply to Alternative B - 160-acre well spacing alternative.

2.7 SUMMARY OF ENVIRONMENTAL IMPACTS

Significant project features which vary by alternative are summarized and compared in Table 2.7-1. Impacts of the Proposed Action and Alternatives are summarized and compared in Table 2.7-2, based on the issues described in Chapter 1 and the assessment of impacts in Chapter 4.

TABLE 2.2-1
PROPOSED ACTION - 160-ACRE WELL SPACING - SOURCES AND EXTENT OF PROPOSED DISTURBANCE[1]

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
FEDERAL LANDS (SURFACE)[2]				
Production Wells	347		484	484
Transportation Corridors[3]		191	1597	775
Pipelines[4]		21	94	0
Compressor Sites	0		0	0
Injection Wells	3		24	24
Evaporation Ponds	3		12	12
Subtotal			2,211	1,295
UDWR LANDS				
Production Wells	46		65	65
Transportation Corridors[3]		28	235	117
Pipelines[4]		5	22	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Subtotal			334	194
UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS				
Production Wells	69		98	98
Transportation Corridors[3]		49	412	209
Pipelines[4]		13	57	0
Compressor Sites	5		25	25
Injection Wells	2		16	16
Evaporation Ponds	2		8	8
Subtotal			616	356
PRIVATE LANDS				
Production Wells	139		195	195
Transportation Corridors[3]		82	672	301
Pipelines[4]		13	55	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Subtotal			934	508
TOTAL LANDS				
Production Wells	601		842	842
Transportation Corridors[3]		350	2916	1402
Pipelines[4]		51	228	0
Compressor Sites	5		25	25
Injection Wells	7		56	56
Evaporation Ponds	7		28	28
Grand Total			4,095	2,353

[1] Does not include existing wells or facilities.

[2] Disturbance acres for land with federal mineral ownership and non-federal surface ownership are shown on Table 2.2-2.

[3] Transportation corridors include roads, gas and water gathering pipelines/flowlines, and electrical utilities.

[4] Pipelines and utility lines adjacent to existing roads.

TABLE 2.2-2

DISTURBANCE ON SPLIT ESTATE[1] LANDS FOR EACH ALTERNATIVE

Alternative Surface Land Ownership	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Proposed Action - 160-acre spacing		
UDWR	116	70
SITLA	0	0
Private	92	49
Total	208	119
Alternative A - 80-acre spacing		
UDWR	128	79
SITLA	1	1
Private	144	87
Total	273	167
Alternative B1 - Critical Areas Avoidance - 160-acre spacing		
UDWR	64	37
SITLA	0	0
Private	87	47
Total	151	84
Alternative B2 - Critical Areas Avoidance - 80-acre spacing		
UDWR	71	41
SITLA	1	0
Private	129	77
Total	201	118
Alternative C1 - Security Areas Protection - 160-acre spacing		
UDWR	69	42
SITLA	0	0
Private	92	49
Total	161	91
Alternative C2 - Security Areas Protection - 80-acre spacing		
UDWR	87	56
SITLA	1	1
Private	144	87
Total	232	144
No Action Alternative		
UDWR	45	24
SITLA	0	0
Private	48	23
Total	93	47

[1] Split Estate - Surface land ownership by Utah Division of Wildlife Resources (UDWR), Utah School and Institutional Trust Lands Administration (SITLA), or Private Entities with Federal Mineral Ownership.

TABLE 2.2-3

REPRESENTATIVE SCHEDULE OF CONSTRUCTION AND OPERATION DISTURBANCE BASED ON PROPOSED ACTION

Year	Acres Disturbed by Construction by End of Year	Acres Reclaimed During Construction by End of Year	Acres Occupied by Surface Facilities by End of Year	Acres Abandoned and Reclaimed by End of Year	Total Acres Disturbed or Occupied at End of Year*
1	409	174	235	0	409
2	410	174	471	0	645
3	409	174	706	0	880
4	410	174	942	0	1116
5	409	175	1176	0	1351
6	410	174	1412	0	1586
7	409	174	1647	0	1819
8	410	174	1883	0	2057
9	409	174	2118	0	2292
10	410	175	2353	0	2528
11	0	0	2353	0	2353
12	0	0	2353	0	2353
13	0	0	2353	0	2353
14	0	0	2353	0	2353
15	0	0	2353	0	2353
16	0	0	2353	0	2353
17	0	0	2353	0	2353
18	0	0	2353	0	2353
19	0	0	2353	0	2353
20	0	0	2353	0	2353
21	0	0	2118	235	2118
22	0	0	1883	235	1883
23	0	0	1648	235	1648
24	0	0	1412	236	1412
25	0	0	1177	235	1177
26	0	0	942	235	942
27	0	0	706	236	706
28	0	0	471	235	471
29	0	0	236	235	236
30	0	0	0	236	0
Total	4,095	1,742	2,353	2,353	

* Includes short-term (construction) disturbance of current year plus cumulative long-term (operational disturbance).

TABLE 2.2-4

EXISTING CBM FIELD DEVELOPMENT[1]
SOURCES AND EXTENT OF DISTURBANCE

FEDERAL LANDS

Facility	No.	Miles	Acres Affected
Production Wells	1[2]		1.4
Transportation Corridors[3]		1.5	6
Compressor Sites	0		0
Injection Wells	0		0
Evaporation Ponds	0		0
Subtotal			7.4

STATE LANDS

Facility	No.	Miles	Acres Affected
Production Wells	84		118
Transportation Corridors[3]		50.2	196
Compressor Sites	1		5
Injection Wells	1		8
Evaporation Ponds	1		13
Subtotal -			340

PRIVATE LANDS

Facility	No.	Miles	Acres Affected
Production Wells	12		17
Transportation Corridors[3]		6.6	26
Compressor Sites	0		0
Injection Wells	0		0
Evaporation Ponds	0		0
Subtotal			43

TOTAL LANDS

Facility	No.	Miles	Acres Affected
Production Wells	97		137
Transportation Corridors[3]		58.3	228
Compressor Sites	1		5
Injection Wells	1		8
Evaporation Ponds	1		13
Grand Total			391

[1] Total as of end of 1995; RGC is continuing in 1996 to drill wells and construct associated facilities on private and state lands.

[2] Old Texaco well drilled prior to RGC activity; RGC to re-enter and develop as a production well.

[3] Transportation corridors include roads, gas and water gathering pipelines/flowlines, and electrical utilities.

TABLE 2.2-5
SUMMARY OF FACILITIES RESTRICTED FROM CONSTRUCTION BY BLM RAPTOR NEST AVOIDANCE BUFFER ZONES*

Alternative	Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
PROPOSED ACTION - 160-ACRE SPACING					
	Production Wells	17		24	24
	Transportation Corridors		4	65	65
	Total			89	89
ALTERNATIVE A - 80-ACRE SPACING					
	Production Wells	26		36	36
	Transportation Corridors		6	50	50
	Total			86	86
ALTERNATIVE B1 - CRITICAL AREAS AVOIDANCE - 160-ACRE SPACING					
	Production Wells	1		1	1
	Transportation Corridors		<0.5	3	2
	Total			4	3
ALTERNATIVE B2 - CRITICAL ACRES AVOIDANCE - 80-ACRE SPACING					
	Production Wells	1		1	1
	Transportation Corridors		<0.5	3	1
	Total -			4	2
ALTERNATIVE C1 - SECURITY AREAS PROTECTION - 160-ACRE SPACING (BLM PREFERRED ALTERNATIVE)					
	Production Wells	9		13	13
	Transportation Corridors		2	15	7
	Total			28	20
ALTERNATIVE C2 - SECURITY AREAS PROTECTION - 80-ACRE SPACING					
	Production Wells	11		15	15
	Transportation Corridors		2	20	9
	Total			35	24
NO ACTION ALTERNATIVE					
	Production Wells	11		15	15
	Transportation Corridors		2	20	9
	Total			35	24

* Includes only facilities on federal land. No compressor sites, injection wells or evaporation ponds are within raptor nest buffer zones.

TABLE 2.2-6
PROJECT FACILITIES AFFECTED BY WINTER CLOSURE*

Alternative	Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
PROPOSED ACTION - 160-ACRE SPACING					
	Production Wells	189		265	265
	Transportation Corridors		115	964	482
	Compressor Sites	3		15	15
	Total			1244	762
ALTERNATIVE A - 80-ACRE SPACING					
	Production Wells	308		431	431
	Transportation Corridors		142	1205	597
	Compressor Sites	3		15	15
	Total			1651	1043
ALTERNATIVE B1 - CRITICAL AREAS AVOIDANCE - 160-ACRE SPACING					
	Production Wells	75		104	104
	Transportation Corridors		51	448	146
	Compressor Sites	3		15	15
	Total			567	265
ALTERNATIVE B2 - CRITICAL AREAS AVOIDANCE - 80-ACRE SPACING					
	Production Wells	118		165	165
	Transportation Corridors		66	563	187
	Compressor Sites	3		15	15
	Injection Wells	1		8	8
	Evaporation Ponds	1		4	4
	Total			755	379
ALTERNATIVE C1 - SECURITY AREAS PROTECTION - 160-ACRE SPACING (BLM PREFERRED ALTERNATIVE)					
	Production Wells	148		207	207
	Transportation Corridors		87	754	306
	Compressor Sites	3		15	15
	Total			976	528
ALTERNATIVE C2 - SECURITY AREAS PROTECTION - 80-ACRE SPACING					
	Production Wells	239		335	335
	Transportation Corridors		98	940	385
	Compressor Sites	3		15	15
	Total			1290	735

* No injection wells or evaporation ponds would be located within gated area.
Winter closure would not be implemented for the No Action Alternative.

TABLE 2.2-7
ESTIMATED FRESH WATER NEEDS

Activity[1,2]	Proposed Action - 160-acre Spacing	Alternative A - 80-acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-acre Spacing	Alternative B2 - Critical Areas Avoidance 80-acre Spacing	Alternative C1 - Security Areas Protection 160-acre Spacing (BLM Preferred Alternative)	Alternative C2 - Security Areas Protection 80-acre Spacing	No Action
Production well drilling/completion	2,764,600 bbl 356.4 ac-ft	5,073,800 bbl 654 ac-ft	2,005,600 bbl 258.5 ac-ft	3,822,600 bbl 492.7 ac-ft	2,530,000 bbl 326.1 ac-ft	4,659,800 bbl 600.7 ac-ft	1,048,800 bbl 135.2 ac-ft
Injection well drilling/completion	68,600 bbl 8.8 ac-ft	78,400 bbl 10.1 ac-ft	49,000 bbl 6.3 ac-ft	68,600 bbl 8.8 ac-ft	68,600 bbl 8.8 ac-ft	78,400 bbl 10.1 ac-ft	39,200 bbl 5 ac-ft
Road/well pad construction	980,000 bbl 126.3 ac-ft	1,439,200 bbl 185.5 ac-ft	728,000 bbl 93.8 ac-ft	999,600 bbl 128.8 ac-ft	862,400 bbl 111.2 ac-ft	1,324,400 bbl 170.7 ac-ft	431,200 bbl 55.6 ac-ft
Evaporation pond construction	7,588 bbl 1 ac-ft	8,672 bbl 1.1 ac-ft	5,420 bbl 0.7 ac-ft	7,588 bbl 1 ac-ft	7,588 bbl 1 ac-ft	8,672 bbl 1.1 ac-ft	4,336 bbl 0.6 ac-ft
Compressor station construction	9,325 bbl 1.2 ac-ft	9,325 bbl 1.2 ac-ft	9,325 bbl 1.2 ac-ft	9,325 bbl 1.2 ac-ft	9,325 bbl 1.2 ac-ft	9,325 bbl 1.2 ac-ft	9,325 bbl 1.2 ac-ft
TOTAL	3,830,113 bbl 493.7 ac-ft	6,609,397 bbl 852 ac-ft	2,797,345 bbl 360.5 ac-ft	4,907,713 bbl 632.5 ac-ft	3,477,913 bbl 448.3 ac-ft	6,080,597 bbl 783.8 ac-ft	1,532,861 bbl 197.6 ac-ft
Estimated annual consumption (ac-ft/yr)[3]	49	85	36	63	45	78	20

<u>Notes:</u>

bbl - barrels (42 gallons = 1 bbl)

ac-ft - acre-feet

1. Estimated water consumption for each project activity:
   - Production well drilling/completion - 4,600 bbl/well (0.59 acre-feet)
   - Injection well drilling/completion - 9,800 bbl/well (1.26 acre-feet)
   - Evaporation pond construction - 1,084 bbl/site (0.14 acre-feet)
   - Road/well pad construction - 2,800 bbl/mile of road (0.36 acre-feet)
   - Compressor station construction - 9,325 bbl for all 5-ac. sites (0.24 acre-feet/site)
2. Well drilling and completion includes water needs for dust suppression during drilling, cement preparation and well stimulation.
   Road/well pad construction includes water needs for initial road construction, gravel installation and a one-time post-construction magnesium chloride application.
   Compressor station construction includes water needs for construction and gravel installation.
3. Estimated annual consumption based on a 10-year construction schedule.

TABLE 2.2-8

ESTIMATED SAND AND GRAVEL REQUIREMENTS

Facility	Estimated Rate of Application	Proposed Action - 160-acre Spacing	Alternative A - 80-acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-acre Spacing	Alternative B2 - Critical Areas Avoidance 80-acre Spacing	Alternative C1 - Security Areas Protection 160-acre Spacing (BLM Preferred Alternative)	Alternative C2 - Security Areas Protection 80-acre Spacing	No Action
Production Well Pad	376 yd^3/pad	225,976	414,728	163,936	312,456	206,800	380,808	85,728
Injection Well Pad	2,151 yd^3/pad	15,057	17,208	10,755	15,057	15,057	17,208	8,604
Evaporation Pond	160 yd^3/site	1,120	1,280	800	1,120	1,120	1,280	640
Compressor Station	1,345 yd^3/site	6,725	6,725	6,725	6,225	6,725	6,725	6,725
Collector Roads	1,564 yd^3/mile	40,664	40,664	40,664	40,664	40,664	40,664	25,024
Local Roads	1,304 yd^3/mile	67,808	66,504	46,944	46,944	56,072	63,896	29,992
Resource Roads	1,043 yd^3/mile	283,696	455,791	206,514	307,685	249,277	415,114	119,945
TOTAL		641,046	1,002,900	476,338	730,151	575,715	925,695	276,658

TABLE 2.2-9

ESTIMATED EMPLOYMENT REQUIREMENTS FOR CBM FIELD DEVELOPMENT AND OPERATIONS[1] PROPOSED ACTION

Project Phase	Employment Category	Timing	Number of Personnel per Crew	Number of Active Crews	Total Number of Personnel
Construction and Installation	Access Roads	(4 days/mile)	4	4	16
	Well Pad	(2 days/location)	4	4	16
	Pipeline	(10 days/mile)	5	8	40
	Elect. Dist. Lines	(5 days/mile)	4	4	16
	Drilling and Casing	(4 days/well)	4	4	16
	Well Completion and Stimulation	(4 days/well)	10	4	40
	Well Production Equipment	(10 days/well)	8	4	32
	Compressor Facility	(90 days/facility)	20	1	20
	Injection Well	(40 days/well)	8	1	8
	Holding/Evap Pond	(15 days/pond)	4	1	4
Operation and Maintenance	Road/Pad Maintenance	(120 days/year)	3	1	3
	Pumpers	(260 days/year)	1	4	4
	Price Office	(260 days/year)			50
	Well Workover	(5 days/well)	15	1	15
Reclamation and Abandonment	Reclamation				
	- Wells/Roads	(3 days/well pad and 4 days/mile of road)	4	2	8
	- Compressor Facility				
	Dismantling	(30 days/facility)	20	1	20
	Reclamation	(5 days/Facility)	4	1	4

[1] Data provided by RGC, NELCO Contractors, Inc. and Woodward-Clyde.
Estimated total employment for each alternative is provided in Table 4.15-1.

TABLE 2.2-10

PROPOSED ACTION - LOCATION, CAPACITIES, AND IMPORTANT COMPONENTS OF THE COMPRESSOR FACILITIES

Location Land Ownership (Surfman)	Compression Rate[1] (MMcf/day)	Compressor Units[2]	Vertical Separators[3]	Glycol Dehydration Units[4]	Produced Water Storage Tanks	Triethylene Glycol Storage Tanks	Lubricating Oil Tanks
T14S, R8E, Sec. 2	30	6	4	4	2	2	2
T14S, R8E, Sec. 27	30	6	4	4	2	2	2
T14S, R9E, Sec. 32	80	16	10	12	5	4	5
T15S, R9E, Sec. 1[8]	85	17	11	12	5	4	5
T16S, R9E, Sec. 2	50	10	6	7	3	2	3
T16S, R9E, Sec. 16	50	10	6	7	3	2	3

[1] Rate based on number of compressor units at the facility and a rate of 5 MMcf/day/unit

[2] 1,700 HP engines either gas-fired or electric (existing station located in T15S, R9E, Sec. 1 contains all electric engines)

[3] Glycol Dehydration Unit:
- Design Gas Flow Rate - 18 MMSCF/D
- Glycol Contact Tower - 30" O.D. x 20.5' Long, 1000 psig, ASME Coded Vessel
- Glycol Reconcentrator - 550 MBTU/H capacity
- Inlet Three Phase Separator - 24" O.D. x 7' Long, 1000 psig, ASME Coded Vessel

[4] Inlet Separator Design Capacity MMSCF/D
- 64" O.D. x 20' High, 250 psig, ASME Coded Vessel

[5] 200 barrel tanks

[6] 300 gallon tanks

[7] 55 gallon tanks

[8] Existing Compressor Facility (all electric powered compressor units); numbers shown represent total of existing and new units.

TABLE 2.2-11
PROPOSED TYPICAL CHEMICAL USE FOR THE PRICE COALBED METHANE PROJECT

Chemical	Volume Stored	Application
Methanol	None	Antifreeze in water pumps (25 gallons/year)
Ethylene Glycol	500 gallons in tanks/drums at each compressor facility	Dehydration equipment
Gear Oil	None	Pumping unit lubrication (1,000 gallons/year)
Drill Foam	None	Drilling additive
Magnesium Chloride	None	Dust suppression
Aluminum Brite	55 gallons in a drum at warehouse in Price	Facility maintenance
Thread Compound	None	Pipeline maintenance
Bitamastic	1 five-gallon bucket at warehouse facility	Pipe protection
Paint	5 gallons at warehouse in Price	Facilities maintenance
Rust Inhibitor	55 gallons in a drum at facility warehouse in Price	Facilities maintenance
Weed Killer	55 gallons in a drum at warehouse in Price	Weed control
Scale Inhibitor	400 gallons in tank/drum at each injection well and evaporation pond facility	Facilities maintenance
WD-40	one can per vehicle	Lubricant

TABLE 2.3-1
ALTERNATIVE A - FIELD DEVELOPMENT, 80-ACRE WELL SPACING - SOURCES AND EXTENT OF DISTURBANCE[1]

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
FEDERAL LANDS (SURFACE)[2]				
Production Wells	604		844	844
Transportation Corridors[3]		250	2,074	1,031
Pipelines[4]		21	94	0
Compressor Sites	0		0	0
Injection Wells	4		32	32
Evaporation Ponds	4		16	16
Subtotal			3,060	1,923
UDWR LANDS				
Production Wells	66		93	93
Transportation Corridors[3]		32	266	132
Pipelines[4]		5	22	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Subtotal			393	237
UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS				
Production Wells	187		263	263
Transportation Corridors[3]		120	651	325
Pipelines[4]		13	57	0
Compressor Sites	5		25	25
Injection Wells	2		16	16
Evaporation Ponds	2		8	8
Subtotal			1,020	637
PRIVATE LANDS				
Production Wells	246		345	345
Transportation Corridors[3]		112	873	431
Pipelines[4]		13	55	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Subtotal			1,285	788
TOTAL LANDS				
Production Wells	1,103		1,545	1,545
Transportation Corridors[3]		514	3,864	1,919
Pipelines[4]		52	228	0
Compressor Sites	5		25	25
Injection Wells	8		64	64
Evaporation Ponds	8		32	32
Grand Total			5,758	3,585

[1] Does not include existing wells or facilities.

[2] Disturbance acres for land with federal mineral ownership and non-federal surface ownership are shown on Table 2.2-2.

[3] Transportation corridors include roads, gas and water gathering pipelines/flowlines, and electrical utilities.

[4] Pipelines and utility lines adjacent to existing roads.

TABLE 2.3-2

ALTERNATIVE A - FIELD DEVELOPMENT, 80-ACRE SPACING - LOCATION, CAPACITIES, AND IMPORTANT COMPONENTS OF THE COMPRESSOR FACILITIES

Location Land Ownership (Surfman)	Compression Rate[1] (MMcf/day)	Compressor Units[2]	Vertical Separators[3]	Glycol Dehydration Units[4]	Produced Water Storage Tanks	Triethylene Glycol Storage Tanks	Lubricating Oil Tanks
T14S, R8E, Sec. 2	30	6	4	4	2	2	2
T14S, R8E, Sec. 27	30	7	5	5	3	2	3
T14S, R9E, Sec. 32	80	18	11	13	6	4	6
T15S, R9E, Sec. 1[8]	85	18	11	13	6	4	6
T16S, R9E, Sec. 2	50	12	8	9	4	3	4
T16S, R9E, Sec. 16	50	12	8	9	4	3	4

[1] Rate based on number of compressor units at the facility and a rate of 5 MMcf/day/unit

[2] 1,700 HP engines either gas-fired or electric (existing station located in T15S, R9E, Sec. 1 contains all electric engines)

[3] Glycol Dehydration Unit:
Design Gas Flow Rate - 18 MMSCF/D
Glycol Contact Tower - 30" O.D. x 20.5' Long, 1000 psig, ASME Coded Vessel
Glycol Reconcentrator - 550 MBTU/H capacity
Inlet Three Phase Separator - 24" O.D. x 7' Long, 1000 psig, ASME Coded Vessel

[4] Inlet Separator Design Capacity MMSCF/D
64" O.D. x 20' High, 250 psig, ASME Coded Vessel

[5] 200 barrel tanks

[6] 300 gallon tanks

[7] 55 gallon tanks

[8] Existing Compressor Facility (all electric powered compressor units); numbers shown represent total of existing and new units.

TABLE 2.4-1
ALTERNATIVE B1 - CRITICAL AREAS AVOIDANCE, 160-ACRE SPACING - SOURCES AND EXTENT OF DISTURBANCE[1]

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
FEDERAL LANDS (SURFACE)[2]				
Production Wells	195		273	273
Transportation Corridors[3]		120	1,022	518
Pipelines[4]		21	94	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Subtotal			1,401	803
UDWR LANDS				
Production Wells	34		48	48
Transportation Corridors[3]		21	180	90
Pipelines[4]		5	22	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Subtotal			262	150
UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS				
Production Wells	69		97	97
Transportation Corridors[3]		46	386	197
Pipelines[4]		13	57	0
Compressor Sites	5		25	25
Injection Wells	2		16	16
Evaporation Ponds	2		8	8
Subtotal			589	343
PRIVATE LANDS				
Production Wells	138		193	193
Transportation Corridors[3]		73	639	317
Pipelines[4]		13	55	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Subtotal			899	522
TOTAL LANDS				
Production Wells	436		611	611
Transportation Corridors[3]		260	2,227	1,122
Pipelines[4]		52	228	0
Compressor Sites	5		25	25
Injection Wells	5		40	40
Evaporation Ponds	5		20	20
Grand Total			3,151	1,818

[1] Does not include existing wells or facilities.

[2] Disturbance acres for land with federal mineral ownership and non-federal surface ownership are shown on Table 2.2-2.

[3] Transportation corridors include roads, gas and water gathering pipelines/flowlines, and electrical utilities.

[4] Pipelines and utility lines adjacent to existing roads.

TABLE 2.4-2

ALTERNATIVE B1 - CRITICAL AREAS AVOIDANCE, 160-ACRE WELL SPACING - LOCATION, CAPACITIES, AND IMPORTANT COMPONENTS OF THE COMPRESSOR FACILITIES

Location Land Ownership (Surfman)	Compression Rate[1] (MMcf/day)	Compressor Units[2]	Vertical Separators[3]	Glycol Dehydration Units[4]	Produced Water Storage Tanks	Triethylene Glycol Storage Tanks	Lubricating Oil Tanks
T14S, R8E, Sec. 2	20	4	3	3	2	2	2
T14S, R8E, Sec. 27	15	3	2	2	1	1	1
T14S, R9E, Sec. 32	25	5	4	4	2	2	2
T15S, R9E, Sec. 1	85	17	11	12	5	4	5
T16S, R9E, Sec. 2	55	11	7	8	4	3	4
T16S, R9E, Sec. 16	50	10	6	7	3	2	3

[1] Rate based on number of compressor units at the facility and a rate of 5 MMcf/day/unit

[2] 1,700 HP engines either gas-fired or electric (except existing station located in T15S, R9E, Sec. 1 contains all electric engines)

[3] Glycol Dehydration Unit:
Design Gas Flow Rate - 18 MMSCF/D
Glycol Contact Tower - 30" O.D. x 20.5' Long, 1000 psig, ASME Coded Vessel
Glycol Reconcentrator - 550 MBTU/H capacity
Inlet Three Phase Separator - 24" O.D. x 7' Long, 1000 psig, ASME Coded Vessel

[4] Inlet Separator Design Capacity MMSCF/D
64" O.D. x 20' High, 250 psig, ASME Coded Vessel

[5] 200 barrel tanks

[6] 300 gallon tanks

[7] 55 gallon tanks

[8] Existing Compressor Facility (all electric powered compressor units); numbers shown represent total of existing and new units.

TABLE 2.4-3
ALTERNATIVE B2 - CRITICAL AREAS AVOIDANCE, 80-ACRE SPACING - SOURCES AND EXTENT OF DISTURBANCE[1]

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
FEDERAL LANDS (SURFACE)[2]				
Production Wells	351		492	492
Transportation Corridors[3]		159	1,335	670
Pipelines[4]		21	94	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Subtotal			1,933	1,174
UDWR LANDS				
Production Wells	51		72	72
Transportation Corridors[3]		25	212	106
Pipelines[4]		5	22	0
Compressor Sites	0		0	0
Injection Wells	2		16	16
Evaporation Ponds	2		8	8
Subtotal			330	202
UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS				
Production Wells	186		261	261
Transportation Corridors[3]		76	629	314
Pipelines[4]		13	57	0
Compressor Sites	5		25	25
Injection Wells	3		24	24
Evaporation Ponds	3		12	12
Subtotal			1,008	636
PRIVATE LANDS				
Production Wells	243		340	340
Transportation Corridors[3]		97	832	411
Pipelines[4]		13	55	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Subtotal			1,239	763
TOTAL LANDS				
Production Wells	831		1,165	1,165
Transportation Corridors[3]		357	3,008	1,501
Pipelines[4]		52	228	0
Compressor Sites	5		25	25
Injection Wells	7		56	56
Evaporation Ponds	7		28	28
Grand Total			4,510	2,775

[1] Does not include existing wells or facilities.

[2] Disturbance acres for land with federal mineral ownership and non-federal surface ownership are shown on Table 2.2-2.

[3] Transportation corridors include roads, gas and water gathering pipelines/flowlines, and electrical utilities.

[4] Pipelines and utility lines adjacent to existing roads.

TABLE 2.4-4

ALTERNATIVE B2 - CRITICAL AREAS AVOIDANCE, 80-ACRE WELL SPACING - LOCATION, CAPACITIES, AND IMPORTANT COMPONENTS OF THE COMPRESSOR FACILITIES

Location Land Ownership (Surfman)	Compression Rate[1] (MMcf/day)	Compressor Units[2]	Vertical Separators[3]	Glycol Dehydration Units[4]	Produced Water Storage Tanks	Triethylene Glycol Storage Tanks	Lubricating Oil Tanks
T14S, R8E, Sec. 2	20	6	4	5	2	2	2
T14S, R8E, Sec. 27	15	4	3	3	2	2	2
T14S, R9E, Sec. 32	25	6	4	5	2	2	2
T15S, R9E, Sec. 1[8]	85	17	11	12	5	4	5
T16S, R9E, Sec. 2	55	12	8	9	4	3	4
T16S, R9E, Sec. 16	50	11	7	8	4	2	4

[1] Rate based on number of compressor units at the facility and a rate of 5 MMcf/day/unit

[2] 1,700 HP engines either gas-fired or electric (existing station located in T15S, R9E, Sec. 1 contains all electric engines)

[3] Glycol Dehydration Unit:
Design Gas Flow Rate - 18 MMSCF/D
Glycol Contact Tower - 30" O.D. x 20.5' Long, 1000 psig, ASME Coded Vessel
Glycol Reconcentrator - 550 MBTU/H capacity
Inlet Three Phase Separator - 24" O.D. x 7' Long, 1000 psig, ASME Coded Vessel

[4] Inlet Separator Design Capacity MMSCF/D
64" O.D. x 20' High, 250 psig, ASME Coded Vessel

[5] 200 barrel tanks

[6] 300 gallon tanks

[7] 55 gallon tanks

[8] Existing Compressor Facility (all electric powered compressor units); numbers shown represent total of existing and new units.

TABLE 2.5-1
ALTERNATIVE C1 - SECURITY AREAS PROTECTION, 160-ACRE SPACING (BLM PREFERRED ALTERNATIVE)
SOURCES AND EXTENT OF DISTURBANCE[1]

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
FEDERAL LANDS (SURFACE)[2]				
Production Wells	311		434	434
Transportation Corridors[3]		169	1,454	712
Pipelines[4]		21	94	0
Compressor Sites	0		0	0
Injection Wells	3		24	24
Evaporation Ponds	3		12	12
Subtotal			2,018	1,182
UDWR LANDS				
Production Wells	34		48	48
Transportation Corridors[3]		12	160	80
Pipelines[4]		5	22	0
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Subtotal			230	128
UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS				
Production Wells	66		94	94
Transportation Corridors[3]		48	405	205
Pipelines[4]		13	57	0
Compressor Sites	5		25	25
Injection Wells	3		24	24
Evaporation Ponds	3		12	12
Subtotal			617	360
PRIVATE LANDS				
Production Wells	139		194	194
Transportation Corridors[3]		79	652	294
Pipelines[4]		13	55	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Subtotal			913	500
TOTAL LANDS				
Production Wells	550		770	770
Transportation Corridors[3]		308	2,671	1,291
Pipelines[4]		52	228	0
Compressor Sites	5		25	25
Injection Wells	7		56	56
Evaporation Ponds	7		28	28
Grand Total			3,778	2,170

[1] Does not include existing wells or facilities.

[2] Disturbance acres for land with federal mineral ownership and non-federal surface ownership are shown on Table 2.2-2.

[3] Transportation corridors include roads, gas and water gathering pipelines/flowlines, and electrical utilities.

[4] Pipelines and utility lines adjacent to existing roads.

TABLE 2.5-2

ALTERNATIVE C1 - SECURITY AREAS PROTECTION, 160-ACRE WELL SPACING (BLM PREFERRED ALTERNATIVE) LOCATION, CAPACITIES, AND IMPORTANT COMPONENTS OF THE COMPRESSOR FACILITIES

Location Land Ownership (Surfman)	Compression Rate[1] (MMcf/day)	Compressor Units[2]	Vertical Separators[3]	Glycol Dehydration Units[4]	Produced Water Storage Tanks	Triethylene Glycol Storage Tanks	Lubricating Oil Tanks
T14S, R8E, Sec. 2	30	6	5	5	3	3	3
T14S, R8E, Sec. 27	25	5	4	4	2	2	2
T14S, R9E, Sec. 32	35	7	5	5	3	3	3
T15S, R9E, Sec. 1	90	18	11	12	5	4	5
T16S, R9E, Sec. 2	60	12	7	8	4	3	4
T16S, R9E, Sec. 16	60	12	7	8	4	3	4

[1] Rate based on number of compressor units at the facility and a rate of 5 MMcf/day/unit

[2] 1,700 HP either gas-fired or electric (existing station located in T15S, R9E, Sec. 1 contains all electric engines)

[3] Glycol Dehydration Unit:
   Design Gas Flow Rate - 18 MMSCF/D
   Glycol Contact Tower - 30" O.D. x 20.5' Long, 1000 psig, ASME Coded Vessel
   Glycol Reconcentrator - 550 MBTU/H capacity
   Inlet Three Phase Separator - 24" O.D. x 7' Long, 1000 psig, ASME Coded Vessel

[4] Inlet Separator Design Capacity MMSCF/D
   64" O.D. x 20' High, 250 psig, ASME Coded Vessel

[5] 200 barrel tanks

[6] 300 gallon tanks

[7] 55 gallon tanks

[8] Existing Compressor Facility (all electric powered compressor units); numbers shown represent total of existing and new units.

TABLE 2.5-3
ALTERNATIVE C2 - SECURITY AREAS PROTECTION, 160-ACRE SPACING - SOURCES AND EXTENT OF PROPOSED DISTURBANCE

			Acres Disturbed	
Facility	No.	Miles	Short-Term	Long-Term
FEDERAL LANDS (SURFACE)[2]				
Production Wells	543		759	759
Transportation Corridors[3]		226	1,886	940
Pipelines[4]		21	94	0
Compressor Sites	0		0	0
Injection Wells	4		32	32
Evaporation Ponds	4		16	16
Subtotal			2,787	1,747
UDWR LANDS				
Production Wells	48		67	67
Transportation Corridors[3]		21	185	92
Pipelines[4]		5	22	0
Compressor Sites	0		0	0
Injection Wells	0		2	2
Evaporation Ponds	1		4	4
Subtotal			280	165
UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS				
Production Wells	182		256	256
Transportation Corridors[3]		118	641	320
Pipelines[4]		13	57	0
Compressor Sites	5		25	25
Injection Wells	2		16	16
Evaporation Ponds	2		8	8
Subtotal			1,003	625
PRIVATE LANDS				
Production Wells	240		336	336
Transportation Corridors[3]		108	839	415
Pipelines[4]		13	55	0
Compressor Sites	0		0	0
Injection Wells	2		14	14
Evaporation Ponds	1		4	4
Subtotal			1,248	769
TOTAL LANDS				
Production Wells	1,013		1,418	1,418
Transportation Corridors[3]		473	3,551	1,767
Pipelines[4]		52	228	0
Compressor Sites	5		25	25
Injection Wells	8		64	64
Evaporation Ponds	8		32	32
Grand Total			5,318	3,306

[1] Does not include existing wells or facilities.

[2] Disturbance acres for land with federal mineral ownership and non-federal surface ownership are shown on Table 2.2-2.

[3] Transportation corridors include roads, gas and water gathering pipelines/flowlines, and electrical utilities.

[4] Pipelines and utility lines adjacent to existing roads.

TABLE 2.5-4

ALTERNATIVE C2 - SECURITY AREAS PROTECTION, 80-ACRE WELL SPACING - LOCATION, CAPACITIES, AND IMPORTANT COMPONENTS OF THE COMPRESSOR FACILITIES

Location Land Ownership (Surfman)	Compression Rate[1] (MMcf/day)	Compressor Units[2]	Vertical Separators[3]	Glycol Dehydration Units[4]	Produced Water Storage Tanks	Triethylene Glycol Storage Tanks	Lubricating Oil Tanks
T14S, R8E, Sec. 2	20	6	4	5	2	2	2
T14S, R8E, Sec. 27	15	6	4	4	2	2	2
T14S, R9E, Sec. 32	25	15	10	11	4	4	4
T15S, R9E, Sec. 1[8]	85	17	11	12	5	4	5
T16S, R9E, Sec. 2	55	12	8	9	4	3	4
T16S, R9E, Sec. 16	50	11	7	8	4	2	4

[1] Rate based on number of compressor units at the facility and a rate of 5 MMcf/day/unit

[2] 1,700 HP engines either gas-fired or electric (existing station located in T15S, R9E, Sec. 1 contains all electric engines)

[3] Glycol Dehydration Unit:
Design Gas Flow Rate - 18 MMSCF/D
Glycol Contact Tower - 30" O.D. x 20.5' Long, 1000 psig, ASME Coded Vessel
Glycol Reconcentrator - 550 MBTU/H capacity
Inlet Three Phase Separator - 24" O.D. x 7' Long, 1000 psig, ASME Coded Vessel

[4] Inlet Separator Design Capacity MMSCF/D
64" O.D. x 20' High, 250 psig, ASME Coded Vessel

[5] 200 barrel tanks

[6] 300 gallon tanks

[7] 55 gallon tanks

[8] Existing Compressor Facility (all electric powered compressor units); numbers shown represent total of existing and new units.

TABLE 2.6-1
NO ACTION ALTERNATIVE
SOURCES AND EXTENT OF DISTURBANCE[1]

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
FEDERAL LANDS (SURFACE)[2]				
Production Wells	5		8	8
Transportation Corridors[3]		29	259	135
Pipelines[4]		18	82	0
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Subtotal			349	143
UDWR LANDS				
Production Wells	28		39	39
Transportation Corridors[3]		19	165	84
Pipelines[4]		5	22	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Subtotal			238	135
UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS				
Production Wells	69		97	97
Transportation Corridors[3]		38	319	160
Pipelines[4]		14	61	0
Compressor Sites	5		25	25
Injection Wells	2		16	16
Evaporation Ponds	2		8	8
Subtotal			526	306
PRIVATE LANDS				
Production Wells	126		177	177
Transportation Corridors[3]		68	559	277
Pipelines[4]		10	46	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Subtotal			794	466
TOTAL LANDS				
Production Wells	228		321	321
Transportation Corridors[3]		154	1,302	656
Pipelines[4]		47	211	0
Compressor Sites	5		25	25
Injection Wells	4		32	32
Evaporation Ponds	4		16	16
Grand Total			1,907	1,050

[1] Does not include existing wells or facilities.

[2] Disturbance acres for land with federal mineral ownership and non-federal surface ownership are shown on Table 2.2-2.

[3] Transportation corridors include roads, gas and water gathering pipelines/flowlines, and electrical utilities.

[4] Pipelines and utility lines adjacent to existing roads.

TABLE 2.6-2

NO ACTION ALTERNATIVE - LOCATION, CAPACITIES, AND IMPORTANT COMPONENTS OF THE COMPRESSOR FACILITIES

Location Land Ownership (Surfman)	Compression Rate[1] (MMcf/day)	Compressor Units[2]	Vertical Separators[3]	Glycol Dehydration Units[4]	Produced Water Storage Tanks	Triethylene Glycol Storage Tanks	Lubricating Oil Tanks
T14S, R8E, Sec. 2	20	4	2	3	1	1	1
T14S, R8E, Sec. 27	10	2	1	1	1	1	1
T14S, R9E, Sec. 32	45	9	6	7	3	2	2
T15S, R9E, Sec. 1[8]	45	9	10	7	3	2	2
T16S, R9E, Sec. 2	25	5	3	3	2	2	2
T16S, R9E, Sec. 16	5	1	1	1	1	1	1

[1] Rate based on number of compressor units at the facility and a rate of 5 MMcf/day/unit

[2] 1,700 HP engines either gas-fired or electric (existing station located in T15S, R9E, Sec. 1 contains all electric engines)

[3] Glycol Dehydration Unit:
Design Gas Flow Rate - 18 MMSCF/D
Glycol Contact Tower - 30" O.D. x 20.5' Long, 1000 psig, ASME Coded Vessel
Glycol Reconcentrator - 550 MBTU/H capacity
Inlet Three Phase Separator - 24" O.D. x 7' Long, 1000 psig, ASME Coded Vessel

[4] Inlet Separator Design Capacity MMSCF/D
64" O.D. x 20' High, 250 psig, ASME Coded Vessel

[5] 200 barrel tanks

[6] 300 gallon tanks

[7] 55 gallon tanks

[8] Existing Compressor Facility (all electric powered compressor units); numbers shown represent total of existing and new units.

TABLE 2.7-1
SUMMARY COMPARISON OF ALTERNATIVES

Project Components	Proposed Action 160-acre Spacing	Alternative A 80-acre Spacing	Alternative B1 Critical Areas Avoidance 160-acre Spacing	Alternative B2 Critical Areas Avoidance 80-acre Spacing	Alternative C1 Security Areas Protection 160-acre Spacing	Alternative C2 Security Areas Protection 80-acre Spacing	No Action
Gas Production							
Peak Production (MMcf/day)	272	318	230	318	260	346	156
Project Total, first 15 years (bcf)	863	1,277	675	1,089	806	1,228	417
No. of Production Wells							
Existing	97	97	97	97	97	97	97
New	601	1,103	436	831	550	1,013	228
Total	698	1,200	533	928	647	1,110	325
Total Acres of Disturbance							
Short Term	4,095	5,758	3,151	4,510	3,778	5,318	1,907
Long Term	2,353	3,585	1,818	2,775	2,170	3,306	1,050
Total Miles of New Transportation Corridors	350	514	260	357	308	473	154
Total Miles of Gathering Pipelines/Utilities	51	52	52	52	52	52	47
Total Number of Compressor Sites							
Existing	1	1	1	1	1	1	1
New	5	5	5	5	5	5	5
Number of 1700 hp Compressor Units							
Existing	7	7	7	7	7	7	7
New	58	66	43	49	53	60	23
Total Number of Injection Wells							
Existing	1	1	1	1	1	1	1
New	7	8	5	7	7	8	4
Total Number of Evaporation Ponds							
Existing	1	1	1	1	1	1	1
New	7	8	5	7	7	8	4

TABLE 2.7-1
SUMMARY COMPARISON OF ALTERNATIVES

Project Components	Proposed Action 160-acre Spacing	Alternative A 80-acre Spacing	Alternative B1 Critical Areas Avoidance 160-acre Spacing	Alternative B2 Critical Areas Avoidance 80-acre Spacing	Alternative C1 Security Areas Protection 160-acre Spacing	Alternative C2 Security Areas Protection 80-acre Spacing	No Action
Water Consumption							
Project Total (ac-ft)	494	852	361	633	448	784	198
Water Production and Disposal							
Peak Production (ac-ft/day) (including existing 97 wells)	13.8	16.8	11.2	15.4	12.4	16.7	7.4
Project Total, first 15 years (ac-ft)	3,942	5,556	2,588	4,352	3,191	5,261	1,416
Gravel and Aggregate Material Requirements - Project Total (1,000 cubic yards)	641	1,004	476	731	576	926	277
Estimated Employment (no. of jobs)							
Construction period	235-280	423-504	165-196	277-300	212-252	395-470	106-126
Operation period	25-77	45-139	18-54	30-91	23-69	42-129	11-35
Estimated Maximum Number of Daily Round Trips During Construction Season							
Commuter	120	212	90	160	110	195	50
Truck	110	160	75	130	95	150	50
Facilities Affected by BLM Raptor Protection Zones							
Wells (No.)	17	26	1	1	9	11	1
Transportation Corridor (miles)	4	6	<0.5	<0.5	2	2	<0.5
Facilities Affected by Road Closure in Big Game Winter Habitat							
Wells (No.)	189	308	75	118	148	239	65
Roads (miles)	115	142	51	66	87	98	50

TABLE 2.7-2
PRICE COALBED METHANE EIS IMPACT SUMMARY

Type of Potential Impact by Resource	Impacts by Alternative Proposed Action - 160-Acre Spacing	Alternative A - 80-Acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing	Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing	Alternative C1 - Security Areas Protection - 160-Acre Spacing	Alternative C2 - Security Areas Protection - 80-Acre Spacing	No Action
GEOLOGY							
Recovery of gas reserves (total CBM production)	Recovery of 863 bcf of CBM for beneficial use	Recovery of 1,277 bcf of CBM for beneficial use	Recovery of 675 bcf of CBM for beneficial use	Recovery of 1,089 bcf of CBM for beneficial use	Recovery of 806 bcf of CBM for beneficial use	Recovery of 1,228 bcf of CBM for beneficial use	Recovery of 417 bcf of CBM for beneficial use
WATER RESOURCES							
Loss of highly erodible soils, potentially contributing to sedimentation of surface water resources	Soil loss of 1,235 to 29,230 tons per year.	Soil loss of 1,540 to 36,441 tons per year.	Soil loss of 944 to 22,346 tons per year.	Soil loss of 1,229 to 29,084 tons per year.	Soil loss of 1,139 to 26,956 tons per year.	Soil loss of 1,426 to 33,759 tons per year.	Soil loss of 607 to 14,361 tons per year.
Erosion of highly saline soils, potentially affecting surface water quality	Salt loading to regional water systems of 8 to 194 tons per year.	Salt loading to regional water systems of 11 to 255 tons per year.	Salt loading to regional water systems of 7 to 167 tons per year.	Salt loading to regional water systems of 10 to 229 tons per year.	Salt loading to regional water systems of 8 to 189 tons per year.	Salt loading to regional water systems of 11 to 250 tons per year.	Salt loading to regional water systems of 8 to 194 tons per year.
Relocation, evaporation and/or loss of water resources of the Ferron Sandstone	Relocation evaporation and/or water quality degradation of 107,000 BWPD	Relocation evaporation and/or water quality degradation of 130,500 BWPD	Relocation evaporation and/or water quality degradation of 86,500 BWPD	Relocation evaporation and/or water quality degradation of 119,539 BWPD	Relocation evaporation and/or water quality degradation of 96,250 BWPD	Relocation evaporation and/or water quality degradation of 129,500 BWPD	Relocation evaporation and/or water quality degradation of 58,000 BWPD
Change in Water Use	Change in use of 3,830,113 barrels (494 ac-ft) of water	Change in use of 6,609,397 barrels (852 ac-ft) of water	Change in use of 2,797,345 barrels (361 ac-ft) of water	Change in use of 4,907,713 barrels (633 ac-ft) of water	Change in use of 3,477,913 barrels (448 ac-ft) of water	Change in use of 6,080,597 barrels (784 ac-ft) of water	Change in use of 1,532,861 barrels (198 ac-ft) of water
AIR QUALITY							
Increase in gaseous and particulate emissions from construction-related activities and associated facilities	Moderate, short-term, and transient; possibility for locally elevated gaseous and particulate emissions	Similar to Proposed Action, with greater likelihood of locally elevated gaseous and particulate emissions because of increased facilities.	Similar to Proposed Action, with less likelihood of locally elevated gaseous and particulate emissions because of reduced facilities.	Similar to Proposed Action, with increased likelihood of locally elevated gaseous and particulate emissions because of decreased facilities.	Similar to Proposed Action.	Similar to Proposed Action, with increased likelihood of locally elevated emissions because of increased facilities.	Similar to Proposed Action, with reduced likelihood of locally elevated emissions because of decreased facilities.

TABLE 2.7-2
(Continued)

Type of Potential Impact by Resource	Impacts by Alternative						
	Proposed Action - 160-Acre Spacing	Alternative A - 80-Acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing	Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing	Alternative C1 - Security Areas Protection - 160-Acre Spacing	Alternative C2 - Security Areas Protection - 80-Acre Spacing	No Action
AIR QUALITY (Continued)							
Gaseous emissions from the operation of coalbed methane wells, gas-fired compressors, and glycol dehydration units at the compressor facilities	Minor increases in NO2 and CO2 levels, 20 µg/m3 for NO2 (annual) and 815 and 533 µg/m3 for 1-hour and 8-hour CO. No significant impacts to air quality and regional visibility. Under worst-case atmospheric conditions a plume from the compressor station may be visible from Price.	Minor increases in NO2 and CO2 levels, 22.5 µg/m3 for NO2 (annual) and 917 and 599 µg/m3 for 1-hour and 8-hour CO. No significant impacts to air quality and regional visibility. Under worst-case atmospheric conditions a plume from the compressor station may be visible from Price.	Minor increases in NO2 and CO2 levels, 5 µg/m3 for NO2 (annual) and 239 and 133 µg/m3 for 1-hour and 8-hour CO. No significant impacts to air quality and regional visibility. Under worst-case atmospheric conditions a plume from the compressor station may be visible from Price.	Minor increases in NO2 and CO2 levels, 9 µg/m3 for NO2 (annual) and 349 and 228 µg/m3 for 1-hour and 8-hour CO. No significant impacts to air quality and regional visibility. Under worst-case atmospheric conditions a plume from the compressor station may be visible from Price.	Minor increases in NO2 and CO2 levels, 8 µg/m3 for NO2 (annual) and 239 and 133 µg/m3 for 1-hour and 8-hour CO. No significant impacts to air quality and regional visibility. Under worst-case atmospheric conditions a plume from the compressor station may be visible from Price.	Minor increases in NO2 and CO2 levels, 19 µg/m3 for NO2 (annual) and 769 and 484 µg/m3 for 1-hour and 8-hour CO. No significant impacts to air quality and regional visibility. Under worst-case atmospheric conditions a plume from the compressor station may be visible from Price.	Minor increases in NO2 and CO2 levels, 10 µg/m3 for NO2 (annual) and 432 and 282 µg/m3 for 1-hour and 8-hour CO. No significant impacts to air quality and regional visibility. Under worst-case atmospheric conditions a plume from the compressor station may be visible from Price.
SOILS							
Loss of highly erodible soils, potentially contributing to sedimentation of surface water resources	Soil loss of 1,235 to 29,230 tons per year.	Soil loss of 1,540 to 36,441 tons per year.	Soil loss of 944 to 22,346 tons per year.	Soil loss of 1,229 to 29,084 tons per year.	Soil loss of 1,139 to 26,956 tons per year.	Soil loss of 1,426 to 33,759 tons per year.	Soil loss of 607 to 14,361 tons per year.
Erosion of highly saline soils, potentially effecting surface water quality	Salt loading to regional water systems of 8 to 194 tons per year.	Salt loading to regional water systems of 11 to 255 tons per year.	Salt loading to regional water systems of 7 to 167 tons per year.	Salt loading to regional water systems of 10 to 229 tons per year.	Salt loading to regional water systems of 8 to 189 tons per year.	Salt loading to regional water systems of 11 to 250 tons per year.	Salt loading to regional water systems of 8 to 194 tons per year.
Disturbance of material unsuitable for reclamation	An alternate source of cover soil material would be necessary to reclaim 151 acres.	An alternate source of cover soil material would be necessary to reclaim 207 acres.	An alternate source of cover soil material would be necessary to reclaim 142 acres.	An alternate source of cover soil material would be necessary to reclaim 198 acres.	An alternate source of cover soil material would be necessary to reclaim 150 acres.	An alternate source of cover soil material would be necessary to reclaim 206 acres.	An alternate source of cover soil material would be necessary to reclaim 76 acres.

TABLE 2.7-2
(Continued)

Type of Potential Impact by Resource	Impacts by Alternative						
	Proposed Action - 160-Acre Spacing	Alternative A - 80-Acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing	Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing	Alternative C1 - Security Areas Protection - 160-Acre Spacing	Alternative C2 - Security Areas Protection - 80-Acre Spacing	No Action
VEGETATION							
Loss of vegetation	Moderate impacts - 4,095 acres affected by construction (2.2% of project area), 2,353 acres occupied by facilities during operation. Mainly sagebrush-grass, salt desert, and pinyon-juniper are affected.	Moderate impacts, about 40% more area affected than Proposed Action, 5,758 acres from construction (3.1% of project area), 3,585 acres during operation. Mainly sagebrush-grass, salt desert, and pinyon-juniper are affected.	Moderate impacts, about 25% less than Proposed Action, 3,151 acres from construction (1.7% of project area), 1,818 acres during operation. Mainly sagebrush-grass, and salt desert are affected.	Moderate impacts, about 10% more than Proposed Action, 4,510 acres from construction (2.4% of project area), 2,775 acres during operation. Mainly sagebrush-grass, and salt desert are affected.	Moderate impacts, about 8% less than Proposed Action, 3,778 acres from construction (2.1% of project area), 2,170 acres during operation. Mainly sagebrush-grass, salt desert, and pinyon-juniper are affected.	Moderate impacts, about 40% more than Proposed Action, 5,318 acres from construction (2.8% of project area), 3,306 acres during operation. Mainly sagebrush-grass, salt desert, and pinyon-juniper are affected.	Moderate impacts, about half the area of the Proposed Action, 1,907 acres from construction (1.0% of project area), 1,050 acres during operation. Mainly sagebrush-grass, salt desert, and agriculture are affected.
Loss and disturbance of riparian vegetation	Moderate impacts - up to 73 acres of riparian/wetland impacts during construction, 42 during operation. Most impacts are avoidable, and post-mitigation impacts likely to be much smaller.	Moderate impacts - up to 100 acres during construction and 63 acres during operation. Post-mitigation impacts will be much smaller.	Moderate impacts, same as Proposed Action.	Moderate impacts. Up to 100 acres during construction, and 63 acres during operational Post-mitigation impacts will be smaller.	Moderate impacts, similar to Proposed Action.	Moderate impacts, similar to Alternative A.	Moderate impacts. Up to 57 acres during construction, and 33 acres during operation. Post-mitigation impacts will be smaller.
Loss of pinyon-juniper woodland	Moderate impacts - 470 acres removed by construction (1.4% of pinyon-juniper in study area), of which 275 acres would be occupied by facilities. Impacts long-term.	Moderate impacts, but 40% larger than Proposed Action. 658 acres removed during construction (2.0% of pinyon-juniper in study area), 412 acres occupied during operation.	Moderate impacts, about half of area affected by Proposed Action, 235 acres removed during construction (0.7% of pinyon-juniper in study area), 126 acres occupied during operation.	Moderate impacts, about 30% less area than Proposed Action, 325 acres removed by construction (1.0% of this type in study area) and 188 acres occupied during operation.	Moderate impacts, about 13% less area than Proposed Action, 408 acres removed by construction (1.2% of pinyon-juniper in study area), and 236 acres occupied during operation.	Moderate impacts, about 20% more than Proposed Action, 560 acres removed by construction (1.7% of pinyon-juniper in study area), and 347 acres occupied during operation.	Moderate impacts, about 35% of the area affected by Proposed Action, 171 acres removed during construction (0.5% of type in study area), and 86 acres occupied during operation.

TABLE 2.7-2
(Continued)

Type of Potential Impact by Resource	Impacts by Alternative: Proposed Action - 160-Acre Spacing	Alternative A - 80-Acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing	Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing	Alternative C1 - Security Areas Protection - 160-Acre Spacing	Alternative C2 - Security Areas Protection - 80-Acre Spacing	No Action
VEGETATION (Continued)							
Invasion of noxious weeds	Low impacts - weeds will tend to invade and spread in disturbed areas, but noxious weed control is required by law and committed to by RGC.	Low impacts, similar to Proposed Action, but 40% more land would be vulnerable.	Low impacts, similar to Proposed Action, but 25% less land would be vulnerable.	Low impacts, similar to Proposed Action, but 10% more land would be vulnerable	Low impacts, similar to Proposed Action, but 8% less land would be vulnerable.	Low impacts, similar to Proposed Action, but 40% more land would be vulnerable	Low impacts, similar to Proposed Action, but 50% less land would be vulnerable.
Revegetation	Moderate impacts. Revegetation will be difficult in some areas, but monitoring and retreatment of failures should prevent significant impacts.	Moderate impacts, similar to Proposed Action, except 40% more land disturbed/ revegetated.	Moderate impacts, similar to Proposed Action, but 25% less land disturbed/ revegetated.	Moderate impacts, similar to Proposed Action, but 10% more land disturbed/ revegetated.	Moderate impacts, similar to Proposed Action, but 8% less land disturbed/ revegetated	Moderate impacts, similar to Proposed Action, but 40% more land disturbed/ revegetated	Moderate impacts, similar to Proposed Action, but 50% less land requiring revegetation.
WETLANDS							
Loss of wetlands	Low to moderate impacts. Exact acres of impact are not available, and will be kept low by application of mitigations. 73 acres of wetland/riparian vegetation are potentially affected by construction, and 42 acres by operation.	Similar to Proposed Action, but larger area potentially affected, 100 acres of wetland/ riparian from construction, and 63 acres from operational	Similar to Proposed Action, and same area affected, 73 acres of wetland/riparian from construction, and 42 acres from operation.	Similar to Proposed Action, but larger area potentially affected, 100 acres of wetland/ riparian from construction, and 63 acres from operation.	Similar to Proposed Action, and same area potentially affected.	Similar to Proposed Action, by more area potentially affected, same as Alternative A.	Similar to Proposed Action, but smaller area potentially affected, 57 acres of wetland/riparian from construction, and 33 acres from operation.
WILDLIFE							
Loss of mule deer habitat	High - 1.4% of critical winter habitat (CW) and high value winter habitat (HV) occupied by facilities; displacement from 19% of CW and 21% of HV in study area; estimated reduction of 18% of winter carrying capacity and reduction in target population of 2,520 deer in Northeast Manti herd unit (NEM).	High - 2.1% of CW and 1.8% of HV occupied by facilities; displacement from 24% of CW and 26% of HV; estimated reduction of 23% of winter carrying capacity and 3,220 deer in NEM.	Moderate to high - 0.5% of CW and 1.2% of HV occupied by facilities; displacement from 9% of CW and 20% of HV; estimated reduction of 8% of winter carrying capacity and 1,120 deer in NEM.	High - 0.8% of CW and 1.6% of HV occupied by facilities; displacement from 12% of CW and 25% of HV; estimated reduction of 11% of winter carrying capacity and 1,520 deer in NEM.	High - 1.2% of CW and 1.3% of HV occupied by facilities; displacement from 17% of CW and 21% of HV; estimated reduction of 16% of winter carrying capacity and 2,240 deer in NEM.	High - 1.7% of CW and of HV occupied by facilities; displacement from 21% of CW and 25% of HV; estimated reduction of 20% of winter carrying capacity and 2,800 deer in NEM.	Moderate to high - 0.5% of CW and 0.6% of HV occupied by facilities; displacement from 8% of CW and 9% of HV; estimated reduction of 8% of winter carrying capacity and 1,200 deer in NEM.

TABLE 2.7-2
(Continued)

Type of Potential Impact by Resource	Impacts by Alternative						
	Proposed Action - 160-Acre Spacing	Alternative A - 80-Acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing	Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing	Alternative C1 - Security Areas Protection - 160-Acre Spacing	Alternative C2 - Security Areas Protection - 80-Acre Spacing	No Action
WILDLIFE (Continued)							
Loss of elk habitat	High - 1.6% of critical winter habitat (CW) and 1.4% high value winter habitat (HV) occupied by facilities; displacement from 36% of CW and 56% of HV in study area; estimated reduction of 11% in winter carrying capacity and reduction in target population of 1,210 elk in Manti herd unit.	High - 2.1% of CW and 2.0% of HV occupied by facilities; displacement from 36% of CW and 57% of HV; estimated reduction of 11% of winter carrying capacity and 1,210 elk in Manti.	Moderate to high - 1.0% of CW and 0.8% of HV occupied by facilities; displacement from 32% of CW and 43% of HV; estimated reduction of 10% of winter carrying capacity and 1,100 elk in Manti.	High - 1.4% of CW and 1.1% HV occupied by facilities; displacement from 33% of CW and 46% of HV; estimated reduction of 10% of winter carrying capacity and 1,100 elk in Manti.	High - 1.2% of CW and 1.3% of HV occupied by facilities; displacement from 31% of CW and 57% of HV; estimated reduction of 9% of winter carrying capacity and 990 elk in Manti.	High - 1.6% of CW and 1.8% of HV occupied by facilities; displacement from 32% of CW and 58% of HV; estimated reduction of 10% of winter carrying capacity and 1,100 elk in Manti.	Moderate to high - 0.8% of CW and 0.5% of HV occupied by facilities; displacement from 21% of CW and 32% of HV; estimated reduction of 6% of winter carrying capacity and 660 elk in Manti.
Loss of black bear habitat	Moderate - 1.2% of high value yearlong habitat (HV) occupied by facilities; displacement from 84% of HV in study area; minor effects on regional population.	Moderate - 1.5% of HV occupied by facilities; displacement from 84% of HV; minor effects on regional population.	Moderate - 0.9% of HV occupied by facilities; displacement from 67% of HV; minor effects on regional population.	Moderate - 1.2% of HV occupied by facilities; displacement from 70% of HV; minor effects on regional population.	Moderate - 0.9% of HV occupied by facilities; displacement from 65% of HV; minor effects on regional population.	Moderate - 1.2% of HV occupied by facilities; displacement from 66% of HV; minor effects on regional population.	Moderate - 0.9% of HV occupied by facilities; displacement of bear from 65% of HV; minor effects on regional population.
Loss of mountain lion habitat	High - displacement from 78% of habitat.	High - displacement from 80% of habitat.	Moderate - displacement from 56% of habitat.	Moderate to high - displacement from 71% of habitat	Moderate to high - displacement from 71% of habitat	Moderate to high - displacement from 74% of habitat	Moderate - displacement from 44% of habitat
Loss of pronghorn antelope habitat	Moderate - 1.0% of high value yearlong habitat (HV) occupied by facilities; displacement from 12% of HV in study area; minor effects on regional population.	Moderate - 1.6% of HV occupied by facilities; displacement from 17% of HV; minor effects on regional population.	Same as Proposed Action	Same as Alternative A	Same as Proposed Action	Same as Alternative A	Moderate - 0.6% of HV occupied by facilities; displacement of antelope from 6% of HV; minor effects on regional population.
Loss of moose habitat	Low - 60% of limited value habitat affected by displacement; no effect on regional population.	Low - 60% of limited value habitat affected by displacement; no effect on regional populations.	Low - 55% of limited value habitat affected by displacement; no effect on regional populations.	Low - 56% of limited value habitat affected by displacement; no effect on regional populations.	Low - 48% of limited value habitat affected by displacement; no effect on regional populations.	Low - 49% of limited value habitat affected by displacement; no effect on regional populations.	Low - 54% of limited value habitat affected by displacement; no effect on regional populations.`

TABLE 2.7-2
(Continued)

Type of Potential Impact by Resource	Impacts by Alternative						
	Proposed Action - 160-Acre Spacing	Alternative A - 80-Acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing	Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing	Alternative C1 - Security Areas Protection - 160-Acre Spacing	Alternative C2 - Security Areas Protection - 80-Acre Spacing	No Action
WILDLIFE (Continued)							
Mortality and stress from collisions with traffic, illegal hunting and harassment.	The enlarged and improved road network would increase the potential for impacts.	Impacts similar to Proposed Action, but likely to be larger because more roads in sensitive wildlife habitats.	Impacts similar to Proposed Action, but likely to be smaller because less roads in sensitive wildlife habitats, and restrictions on development in critical areas.	Impact similar to Proposed Action, but likely to be smaller because of restrictions on development in critical areas.	Impacts similar to Proposed Action, but likely to be somewhat smaller because of fewer miles of roads, and restriction of development in big game security areas.	Impacts similar to Proposed Action, but likely to be larger because of the increased road network.	Impacts similar to Proposed Action, but likely to be smaller, because of the reduced road network.
Loss of community structure and function of prairie dog complexes	Negligible. Prairie dog complexes may be affected by construction, but prairie dogs are likely to occupy disturbed areas.	Similar to Proposed Action, but increased density of facilities would increase disturbance area.	Same as Proposed Action.	Same as Alternative A.	Same as Proposed Action.	Same as Alternative A.	Similar to Proposed Action on non-federal lands; no effect on federal lands.
Loss or disturbance of raptor nesting habitat	No direct impacts on nests. May be increased stress and disturbance on non-federal lands. Thirteen nests are within 1/2 mile of proposed facilities; four would be affected by facilities on non-federal land.	Similar to Proposed Action. Fifteen nests within 1/2 mile of facilities; seven would be affected by facilities on non-federal land.	Similar to Proposed Action, but less potential for disturbance because federal lands in northwest part of Project Area would not be developed. Four raptor nests within 1/2 mile of facilities; all would be affected by facilities on non-federal land.	Similar to Alternative B1. Eight nests within 1/2 mile of facilities, all would be affected by facilities on non-federal lands.	Similar to Proposed Action, but less potential for disturbance because security areas would not be developed. Eleven nests within 1/2 mile of facilities; four would be affected by facilities on non-federal land.	Similar to Alternative C1. Thirteen nests within 1/2 mile of facilities; six would be affected by facilities on non-federal land.	Similar to Proposed Action, with reduced potential for disturbance because most federal lands would not be developed. Four nests within 1/2 mile of facilities; all would be affected by facilities on non-federal land.

TABLE 2.7-2
(Continued)

Type of Potential Impact by Resource	Impacts by Alternative						
	Proposed Action - 160-Acre Spacing	Alternative A - 80-Acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing	Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing	Alternative C1 - Security Areas Protection - 160-Acre Spacing	Alternative C2 - Security Areas Protection - 80-Acre Spacing	No Action
WILDLIFE (Continued)							
Loss of sage grouse strutting and nesting habitat	Project may prevent re-establishment of sage grouse.	Same as Proposed Action.	Reduced potential for preventing re-establishment of sage grouse; historic habitat on Telephone and Horse Bench would not be developed.	Same as Alternative B1.	Reduced potential for preventing re-establishment of sage grouse; historic habitat on Telephone Bench would not be developed.	Same as Alternative C2.	Reduced potential for preventing re-establishment of sage grouse; historic habitat on Telephone and Horse Bench would not be developed.
Loss or disturbance of breeding bird habitat	Low. Short- and long-term loss of habitat and displacement of breeding birds.	Similar to Proposed Action, but 40% more affected area.	Similar to Proposed Action, but 25% less affected area.	Similar to Proposed Action; almost 10% more affected area.	Similar to Proposed Action, about 8% less affected area.	Similar to Proposed Action, about 40% more affected area.	Similar to Proposed Action, about 50% less affected area.
SPECIAL STATUS SPECIES							
Effects on federally listed endangered or threatened species	May adversely affect peregrine falcon. Not likely to have adverse effects on bald eagle and 4 Colorado River fish species. No effect on black-footed ferret or listed plant species.	Same as Proposed Action.	Same as Proposed Action.	Same as Proposed Action.	Same as Proposed Action.	Same as Proposed Action.	Same as Proposed Action.
Effects on sensitive species	Negligible to low on federal lands. Low to moderate on other lands - construction may destroy or disturb loggerhead shrike and burrowing owl nests, and sensitive plants. Ferruginous hawk may be prevented from establishing new nests.	Similar to Proposed Action, but more potential habitat affected.	Similar to Proposed Action, but less potential habitat affected.	Similar to Proposed Action, but more potential habitat affected.	Similar to Proposed Action, but less potential habitat affected.	Similar to Proposed Action, but more potential habitat affected.	Similar to Proposed Action, but less potential habitat affected.

TABLE 2.7-2
(Continued)

Type of Potential Impact by Resource	Impacts by Alternative: Proposed Action - 160-Acre Spacing	Alternative A - 80-Acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing	Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing	Alternative C1 - Security Areas Protection - 160-Acre Spacing	Alternative C2 - Security Areas Protection - 80-Acre Spacing	No Action
CULTURAL RESOURCES							
Direct disturbance or destruction of significant sites	1,613 acres of high sensitivity (1.9% of the total) and 1,985 acres of medium sensitivity (2.4% of the total) area affected by construction.	Impacts are approximately 35% more than the Proposed Action - 2,109 acres of high sensitivity (2.4% of the total) and 2,754 acres of medium sensitivity (3.3% of the total) are affected.	Impacts are approximately 25% less than the Proposed Action - 1,216 acres of high sensitivity (1.4% of the total) and 1,439 acres of medium sensitivity (1.8% of the total) are affected by construction.	Impacts are approximately the same as the Proposed Action - 1,625 acres of high sensitivity (1.9% of the total) and 2,008 acres of medium sensitivity (2.4% of the total) are affected by construction.	Impacts are approximately 10% less than from the Proposed Action - 1,389 acres of high sensitivity (1.6% of the total) and 1,894 acres of medium sensitivity (2.3% of the total) area affected by construction	Impacts are approximately 25% more than the Proposed Action - 1,805 acres of high sensitivity (2.1% of the total) and 2,616 acres of medium sensitivity (3.2% of the total) are affected by construction.	Impacts are approximately 55% less than the Proposed Action - 998 acres of high sensitivity (1.2% of the total) and 678 acres of medium sensitivity (0.8% of the total) area affected by construction.
Indirect loss of important cultural materials due to private collection or vandalism	Impacts are spread throughout entire study area - 7,487 acres of high sensitivity (8.7% of the total) and 6,168 acres of medium sensitivity (7.5% of the total) are potentially affected.	Impacts are approximately 45% more than the Proposed Action and are spread throughout the entire study area - 10,327 acres of high sensitivity (11.9% of the total) and 9,571 acres of medium sensitivity (11.7% of the total) are potentially affected	Impacts are approximately 30% less than the Proposed Action and are restricted to a smaller geographic area- 5,263 acres of high sensitivity (6.1% of the total) and 4,321 acres of medium sensitivity (5.3% of the total) are potentially affected.	Impacts are approximately 5% more than the Proposed Action but are restricted to a smaller geographic area - 7,518 acres of high sensitivity (8.7% of the total) and 6,709 acres of medium sensitivity (8.2% of the total) are potentially affected.	Impacts are approximately 10% less than the Proposed Action and are restricted to a smaller geographic area - 6,213 acres of high sensitivity (7.2% of the total) and 5,825 acres of medium sensitivity (7.1% of the total) are potentially affected.	Impacts are approximately 30% more than the Proposed Action but are restricted to a smaller geographic area - 8,648 acres of high sensitivity (10.0% of the total) and 9,035 acres of medium sensitivity (11.0% of the total) are potentially affected.	Impacts are approximately 55% less than the Proposed Action - 4,355 acres of high sensitivity (5.0% of the total) and 1,872 acres of medium sensitivity (2.3% of the total) are potentially affected.

TABLE 2.7-2
(Continued)

Type of Potential Impact by Resource	Proposed Action - 160-Acre Spacing	Alternative A - 80-Acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing	Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing	Alternative C1 - Security Areas Protection - 160-Acre Spacing	Alternative C2 - Security Areas Protection - 80-Acre Spacing	No Action
	Impacts by Alternative						
CULTURAL RESOURCES (Continued)							
Direct or indirect disturbance or destruction of important Native American religious or culturally significant sites	A combined total of 13,655 acres in areas of high and medium sensitivity for cultural resources (8.1% or the total) are potentially affected.	Impacts are approximately 45% more than the Proposed Action. A combined total of 19,898 acres in areas of high and medium sensitivity for cultural resources (11.8% of the total) are potentially affected.	Impacts are approximately 30% less than the Proposed Action. A combined total of 9,583 acres in areas of high and medium sensitivity for cultural resources (5.7% of the total) are potentially affected.	Impacts are approximately 5% more than the Proposed Action. A combined total of 14,227 acres in areas of high and medium sensitivity for cultural resources (8.4% of the total) are potentially affected.	Impacts are approximately 10% less than the Proposed Action. A combined total of 12,038 acres in areas of high and medium sensitivity for cultural resources (7.1% of the total) are potentially affected.	Impacts are approximately 30% more than the Proposed Action. A combined total of 17,683 acres in areas of high and medium sensitivity for cultural resources (10.5% of the total) are potentially affected	Impacts are approximately 55% less than the Proposed Action. A combined total of 6,227 acres in areas of high and medium sensitivity for cultural resources (3.7% of the total) are potentially affected.
LAND USE							
Direct impacts to agricultural land and operations	Would physically impact 191 acres of irrigated agriculture during construction and result in permanent loss of 117 acres during life of the project. (1.0% of irrigated agriculture in Project Area.)	Would physically impact 287 acres of irrigated agriculture during construction and result in permanent loss of 188 acres during life of the project. (1.7% of irrigated agriculture in Project Area.)	Same as Proposed Action.	Same as Alternative A.	Would physically impact 188 acres of irrigated agriculture during construction and result in permanent loss of 115 acres during life of the project. (1.0% of irrigated agriculture in Project Area.)	Would physically impact 284 acres of irrigated agriculture during construction and result in permanent loss of 186 acres during life of the project. (1.6% of irrigated agriculture in Project Area.)	Would physically impact 169 acres of irrigated agriculture during construction and result in permanent loss of 107 acres during life of the project. (1.0% of irrigated agriculture in Project Area.)
	Impacts potentially significant and unmitigable in split estate ownership areas (8 acres affected short-term, 4 acres long-term).	Impacts potentially significant and unmitigable in split estate ownership areas (13 acres affected short-term, 8 acres long-term).	Same as Proposed Action.	Same as Alternative A.	Impacts significant and potentially unmitigable in split estate ownership areas (7 acres affected short-term, 4 acres long-term).	Same as Alternative A.	Impacts significant and potentially unmitigable in split estate ownership areas (4 acres affected short-term, 3 acres long-term).

TABLE 2.7-2
(Continued)

Type of Potential Impact by Resource	Impacts by Alternative: Proposed Action - 160-Acre Spacing	Alternative A - 80-Acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing	Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing	Alternative C1 - Security Areas Protection - 160-Acre Spacing	Alternative C2 - Security Areas Protection - 80-Acre Spacing	No Action
LAND USE (Continued)							
Land use compatibility impacts to rural residential and community areas (Noise, dust, traffic, safety, visual effects)	Significant incompatibility impacts may occur where CBM facilities/activities are within 0.5 mile of residents (1,399 acres potentially affected).	Similar to Proposed Action (1,836 acres potentially affected).	Similar to Proposed Action (1,045 acres potentially affected).	Similar to Proposed Action (1,360 acres potentially affected)	Similar to Proposed Action (1,338 acres potentially affected).	Similar to Proposed Action (1,735 acres potentially affected).	Similar to Proposed Action (907 acres potentially affected).
	Incompatibility impacts are significant and potentially unmitigable where residential areas would be within 500 feet of wells and/or in areas of split-estate ownership (9 acres of residential affected short-term, 6 acres long-term).	Incompatibility impacts are significant and potentially unmitigable where residential areas would be within 500 feet of wells and/or in areas of split-estate ownership (14 acres of residential affected short-term, 9 long-term).	Same as Proposed Action.	Incompatibility impacts are significant and potentially unmitigable where residential areas would be within 500 feet of wells and/or in areas of split-estate ownership (13 acres of residential affected short-term, 9 acres long-term).	Same as Proposed Action.	Same as Alternative B2.	Incompatibility impacts are significant and potentially unmitigable where residential areas would be within 500 feet of wells and/or in areas of split-estate ownership (8 acres of residential affected short-term, 5 acres long-term).)
	Areas affected would primarily be along Gordon Creek Rd., south of Price and west of Elmo.	Impacts greater than Proposed Action due to 80 acre well spacing. (Same areas affected)	Same areas affected as proposed Action.	Same as Alternative A.	Same as Proposed Action.	Same as Alternative A.	Slightly less impacts than Proposed Action because of decreased development.
	Incompatibility impacts may extend to middleground distances (beyond 0.5 mile) depending on topography, vegetation and land use settings. Impacts may range from significant to slight adverse (see Visual Resources).	Similar to Proposed Action, however, impacts would be greater due to 80 acre well spacing.	Same as Proposed Action	Same as Alternative A.	Similar to Proposed Action.	Same as Alternative A.	Similar to Proposed Action.

TABLE 2.7-2
(Continued)

Type of Potential Impact by Resource	Impacts by Alternative: Proposed Action - 160-Acre Spacing	Alternative A - 80-Acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing	Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing	Alternative C1 - Security Areas Protection - 160-Acre Spacing	Alternative C2 - Security Areas Protection - 80-Acre Spacing	No Action
LAND USE (Continued)							
Inconsistency with state and local plans							
Carbon Co. Trails Plan	Significant conflicts with Carbon County Trails Plan goals and objectives.	Significant conflicts with Carbon County Trails Plan goals and objectives.	Reduced, but significant conflicts with Carbon County Trails Plan goals and objectives.	Reduced, but significant conflicts with Carbon County Trails Plan goals and objectives.	Significant conflicts with Carbon County Trails Plan goals and objectives.	Significant conflicts with Carbon County Trails Plan goals and objectives.	Reduced, but significant conflicts with Carbon County Trails Plan goals and objectives.
Gordon Creek Wildlife Management Area Plan	Significant conflicts with goals and objectives of state wildlife management area. Would require mitigation plan. Wells throughout area.	Significant conflicts with goals and objectives of state wildlife management area. Would require mitigation plan. Wells throughout area.	Reduced, but significant conflicts with goals and objectives of state wildlife management area. Would require mitigation plan. No development in southeast and south-central third, but wells in several security areas.	Reduced, but significant conflicts with goals and objectives of state wildlife management area. Would require mitigation plan. No development in southeast and south-central third, but wells in several security areas.	Reduced, but significant conflicts with goals and objectives of state wildlife management area. Would require mitigation plan. Security areas would not be developed.	Reduced, but significant conflicts with goals and objectives of state wildlife management area. Would require mitigation plan. Security areas would not be developed.	Reduced, but significant conflicts with goals and objectives of state wildlife management area. Mitigation plan would be required. Little development in southern half.
Increase in traffic on local roads.	Modest traffic increase less than significant: 230 trips/day for construction and up to 100 trips/day during operation.	Larger but non-significant traffic increase: 372 trips/day for construction, up to 184 trips/day for operation.	Modest traffic increase, less than significant: 165 trips/day for construction, 73 trips/day for operation.	Larger traffic increase than Proposed Action, but less than significant: 290 trips/day for construction, 139 trips/day for operation.	Modest traffic increase, less than significant: 205 trips/day during construction, 92 for operation.	Larger traffic increase than Proposed Action, but less than significant: 345 trips/day during construction, up to 168 trips/day for operation.	Very small increase in traffic: 100 trips/day during construction, up to 38 trips/day during operation.
Increase maintenance costs on county roads.	Royalty payments would vastly exceed increased road maintenance costs.	Similar to Proposed Action, with both higher revenues and maintenance costs.	Similar to Proposed Action, with lower revenue and maintenance costs.	Similar to Proposed Action, with both higher revenues and maintenance costs.	Similar to Proposed Action, with lower revenue and maintenance costs.	Similar to Proposed Action, with both higher revenues and maintenance costs.	No federal lease royalties; RGC would maintain county roads accessing its facilities.

TABLE 2.7-2
(Continued)

Type of Potential Impact by Resource	Impacts by Alternative: Proposed Action - 160-Acre Spacing	Alternative A - 80-Acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing	Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing	Alternative C1 - Security Areas Protection - 160-Acre Spacing	Alternative C2 - Security Areas Protection - 80-Acre Spacing	No Action
LIVESTOCK MANAGEMENT							
Loss in grazing carrying capacity, as indicated by a reduction in AUMs	Total AUMs lost: Construction - 195 Operation - 116	Total AUMs lost: Construction - 277 Operation - 174	Total AUMs lost: Construction - 152 Operation - 88	Total AUMs lost: Construction - 207 Operation - 128	Total AUMs lost: Construction - 188 Operation - 109	Total AUMs lost: Construction - 259 Operation - 162	Total AUMs lost: Construction - 69 Operation - 36
Impacts from increased traffic and seasonal road closures. Increased traffic may result in greater possibility of livestock accidents and harassment.	Access to be maintained to grazing areas at all times, in all alternatives. Increased potential for livestock harassment, collisions, and reduced quality of forage in areas adjacent to roads and well sites, from project-related traffic	Increased potential (as compared to Proposed Action) for livestock harassment, collisions, and reduced quality of forage in areas adjacent to roads and well sites. Greater traffic levels due to 80-acre well spacing would increase impacts over Proposed Action .	Decreased potential for livestock harassment, collisions, and reduced quality of forage in areas adjacent to roads and well sites as compared to Proposed Action. Critical areas avoidance would reduce traffic levels compared to Proposed Action.	Increased potential for livestock harassment, collisions, and reduced quality of forage in areas adjacent to roads and well sites as compared to Proposed Action. 80-acre well spacing would increase impacts over Alternative B1 and Proposed Action.	Similar potential for livestock harassment, collisions, and reduced quality of forage in areas adjacent to roads and well sites as compared to Proposed Action. Security areas for wildlife would slightly reduce traffic levels compared to Proposed Action.	Increased potential for livestock harassment, collisions, and reduced quality of forage in areas adjacent to roads and well sites as compared to Proposed Action. 80-acre well spacing would greatly increase traffic levels over Alternative C1 and the Proposed Action.	Decreased potential for livestock harassment, collisions, and reduced quality of forage in areas adjacent to roads and well sites as compared to Proposed Action. No CBM development on federal lands would greatly reduce traffic levels compared to all other alternatives.

TABLE 2.7-2
(Continued)

Type of Potential Impact by Resource	Impacts by Alternative						
	Proposed Action - 160-Acre Spacing	Alternative A - 80-Acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing	Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing	Alternative C1 - Security Areas Protection - 160-Acre Spacing	Alternative C2 - Security Areas Protection - 80-Acre Spacing	No Action
RECREATION							
Loss or disturbance of recreational opportunities on public lands used for hiking, jogging, horseback riding, mountain biking, hunting, and planned county trails.	Would impact 3,161 (short-term) and 1,845 (long-term) acres of federal and state lands. Areas north of Price would be avoided by this project, but, would be impacted by the Helper-Price CBM project. Lands west of Price (e.g., Porphyry Bench)would be significantly affected, resulting in a loss in the quality of dispersed recreational activities	Would impact 4,473 (short-term) and 2,797 (long-term) acres of federal and state lands. Areas north of Price would be avoided by this project, but would be impacted by the Helper-Price CBM project. Lands west of Price (e.g., Porphyry Bench) would be significantly affected, resulting in a loss in the quality of dispersed recreational activities	Would impact 2,252 (short-term) and 1,296 (long-term) acres of federal and state lands. Areas north of Price would be avoided by this project, but would be impacted by the Helper-Price CBM project. Wildlife exclusion areas would reduce impacts to land west of Price.	Would impact 3,271 (short-term) and 2,012 (long-term) acres of detail, and state lands. Areas north of Price would be avoided by this project, but would be impacted by the Helper-Price CBM project. Wildlife exclusion areas would reduce impacts to land west of Price.	Would impact 2,865 (short-term) and 1,670 (long-term) acres of federal and state land. The Woodhill-Kenilworth area north of Price would be avoided by this project, but would be impacted by the Helper-Price CBM project Wildlife exclusion areas not as extensive as in Alternative B. The recreational setting would still change to a more developed environment and would still result in some increase in impacts to dispersed recreation.	Would impact 4,070 (short-term) and 2,537 (long-term) acres of federal and state lands. Same types of impacts as in Alternative C1, but of a greater magnitude due to the increase in number of wells.	Would impact 1,113 (short-term) and 584 (long-term) acres of federal and state lands. Areas north of Price would be avoided by this project, but would be impacted by the Helper-Price CBM project. Most lands west of Price would retain their current recreational values.

TABLE 2.7-2
(Continued)

Type of Potential Impact by Resource	Impacts by Alternative						
	Proposed Action - 160-Acre Spacing	Alternative A - 80-Acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing	Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing	Alternative C1 - Security Areas Protection - 160-Acre Spacing	Alternative C2 - Security Areas Protection - 80-Acre Spacing	No Action
VISUAL RESOURCES							
Adverse impacts to scenic quality due to presence of project facilities, construction and operation activities	Would impact BLM lands classified as VRM Class IV (2,114 acres) and Class III (275 acres). Project would meet Class IV standards. Project would not meet VRM Class III standards when located in foreground/ middleground distance zones.	Would impact BLM lands classified as VRM Class IV (2,889 acres) and Class III (402 acres). Project would meet Class IV standards. Project would not meet VRM Class III standards when located in foreground/ middleground distance zones.	Would impact BLM lands classified as VRM Class IV (1,307 acres) and Class III (215 acres). Project would meet Class IV standards. Project would not meet VRM Class III standards when located in foreground/ middleground distance zones.	Would impact BLM lands classified as VRM Class IV (1,797 acres) and Class III (308 acres). Project would meet Class IV standards. Project would not meet VRM Class III standards when located in foreground/ middleground distance zones.	Would impact BLM lands classified as VRM Class IV (1,890 acres) and Class III (259 acres). Project would meet Class IV standards. Project would not meet VRM Class III standards when located in foreground/ middleground distance zones.	Would impact BLM lands classified as VRM Class IV (2,606 acres) and Class III (372 acres). Project would meet Class IV standards. Project would not meet VRM Class III standards when located in foreground/ middleground distance zones.	Would impact BLM lands classified as VRM Class IV (345 acres) and Class III (69 acres). Project would meet Class IV standards. Project would not meet VRM Class III standards when located in foreground/ middleground distance zones.
Visual impacts of project facilities, construction and operation activities from communities, roadways and recreational trails	VRM classes on private and state lands vary from Class II to Class IV depending on viewer presence and sensitivity. Project would significantly alter existing views from recreational trails, highways 10, 122, and 155 and residential areas within foreground distance zones (0.5 mile) Approx. 1,399 acres of residential, highway and recreational foreground distance zones would be affected.	Similar to Proposed Action, but greater impacts due to larger numbers of facilities. Approx. 1,836 acres of residential, highway and recreational foreground distance zones would be affected.	Similar to Proposed Action, but reduced because fewer facilities. Approx. 1,045 acres of residential, highway and recreational foreground distance zones would be affected.	Similar to Proposed Action. Approx. 1,360 acres of residential, highway and recreational foreground distance zones would be affected.	Similar to Proposed Action. Approx. 1,338 acres of residential, highway and recreational foreground distance zones would be affected.	Similar to Proposed Action, but greater impacts due to larger number of facilities. Approx. 1,735 acres of residential, highway and recreational foreground distance zones would be affected.	Similar to Proposed Action, but reduced because fewer facilities. Approx. 907 acres of residential, highway and recreational foreground distance zones would be affected.

TABLE 2.7-2
(Continued)

Type of Potential Impact by Resource	Impacts by Alternative: Proposed Action - 160-Acre Spacing	Alternative A - 80-Acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing	Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing	Alternative C1 - Security Areas Protection - 160-Acre Spacing	Alternative C2 - Security Areas Protection - 80-Acre Spacing	No Action
VISUAL RESOURCES (Continued)							
	Impacts to middleground distance zones would vary from slightly adverse to significant depending on viewer setting (topographic, vegetation screening, other land uses) and the number of CBM facilities and activities seen.	Impacts would similarly vary from slightly adverse to significant. Visual contrasts would be greater than Proposed Action, due to 80 acre well spacing and related increases in ancillary facilities and construction/ operation activities.	Impacts would similarly vary from slightly adverse to significant. Impacts would be substantially less than Proposed Action on views from county recreational trails.	Impacts would similarly vary from slightly adverse to significant. Impacts would be substantially less than Proposed Action on recreation trail views, but greater on highway and residential views because of increased well density.	Impacts would similarly vary from slightly adverse to significant. Impacts to residential and highway views would be similar to the Proposed Action. Impacts to recreational trail views would be slightly less, but still significant.	Impacts would similarly vary from slightly adverse to significant. Impacts to residential and highway views would be similar to the Proposed Action. Impacts to recreational trail views would be recreational trail views would be greater than C1, less than Proposed Action.	Impacts would similarly vary from slightly adverse to significant. Impacts to residential and highway views would be similar to the Proposed Action. Impacts to recreational trail views would be substantially less than Proposed Action.
NOISE							
Increased noise levels associated with well drilling, construction of compressor stations, and operation of construction vehicles and machinery. Increased noise levels associated with well and compressor station operations.	Noise impacts from construction and operational activities depend on the distance between the noise source and the receptor; receptor locations greater than approximately 500 feet from the noise source would not be adversely affected.	Location of facilities under 80-acre well spacing requirements would increase the probability of noise impacts to sensitive receptors in comparison to the Proposed Action.	Same as for the Proposed Action.	Location of facilities under 80-acre well spacing requirements would increase the probability of noise impacts to sensitive receptors in comparison to the Proposed Action.	Same as for the Proposed Action.	Location of facilities under 80-acre well spacing requirements would increase the probability of noise impacts to sensitive receptors in comparison to the proposed Action.	Same as for the Proposed Action.

TABLE 2.7-2
(Continued)

Type of Potential Impact by Resource	Impacts by Alternative: Proposed Action - 160-Acre Spacing	Alternative A - 80-Acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing	Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing	Alternative C1 - Security Areas Protection - 160-Acre Spacing	Alternative C2 - Security Areas Protection - 80-Acre Spacing	No Action
SOCIOECONOMICS AND QUALITY OF LIFE							
Employment	Between 20 and 214 total jobs created until year 2026. Net increase of up to 50 local resident jobs, relative to present during construction. Declining employment thereafter. By project completion, a net loss of 81 local resident jobs would occur, relative to 1996.	Up to 385 total jobs created. Net increase of up to 155 local resident jobs, relative to present, during construction. Declining employment thereafter. By project completion, a net loss of 81 local resident jobs would occur, relative to 1996.	Up to 150 total jobs created. Net increase of up to 11 local resident jobs, relative to present, during construction. Declining employment thereafter. By project completion, a net loss of 81 local resident jobs would occur, relative to 1996.	Up to 253 total jobs created. Net increase of up to 74 local resident jobs, relative to present, during construction. Declining employment thereafter. By project completion, a net loss of 81 local resident jobs would occur, relative to 1996.	Up to 193 total jobs created. Net increase of up to 37 local resident jobs, relative to the present, during construction. Declining employment thereafter. By project completion, a net loss of 81 local resident jobs would occur, relative to 1996.	Up to 360 total jobs created. Net increase of up to 139 local resident jobs, relative to the present, during construction. Declining employment thereafter. By project completion, a net loss of 81 local resident jobs would occur, relative to 1996.	Up to 96 total jobs created. Net decrease of 41 local resident jobs, relative to present, during construction. Declining employment thereafter. By project completion, a net loss of 81 local resident jobs would occur, relative to 1996.
Earnings	$2.67 million first year, increasing to $3.7 million in year 2006, declining thereafter.	$4.8 million first year, increasing to $6.7 million in year 2006, declining thereafter.	$1.86 million first year, increasing to $2.59 million in year 2006, declining thereafter.	$3.15 million first year, increasing to $4.36 million in year 2006, declining thereafter.	$2.4 million first year, increasing to $3.33 million in year 2006, declining thereafter.	$4.49 million first year, increasing to $6.21 million in year 2006, declining thereafter.	$1.2 million first year, increasing to $1.66 million in year 2005, declining thereafter.
Population	Seasonal influx due to transient construction workforce.	Larger seasonal influx due to transient construction workforce.	Reduced seasonal influx due to smaller transient construction workforce.	Larger seasonal influx due to larger transient construction workforce.	Reduced seasonal influx due to smaller transient construction workforce.	Larger seasonal influx due to larger transient construction workforce.	Reduced seasonal influx due to smaller transient construction workforce.
Housing	Little or no increase in demand for temporary housing.	Increased demand for temporary housing.	Little or no increase in demand for temporary housing.	Increased demand for temporary housing.	Little or no increase in demand for temporary housing.	Increased demand for temporary housing.	Reduced demand for temporary housing.
Community Facilities and Services	Little increase in demand. Small influx of permanent workers and their families.	Little increase in demand. Small influx of permanent workers and their families.	No increase in demand. Very small influx of permanent workers and their families.	Little increase in demand. Small influx of permanent workers and their families.	No increase in demand. Very small influx of permanent workers and their families.	Little increase in demand. Small influx of permanent workers and their families.	No increase in demand. No influx of permanent workers and their families.

TABLE 2.7-2
(Continued)

Type of Potential Impact by Resource	Impacts by Alternative						
	Proposed Action - 160-Acre Spacing	Alternative A - 80-Acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing	Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing	Alternative C1 - Security Areas Protection - 160-Acre Spacing	Alternative C2 - Security Areas Protection - 80-Acre Spacing	No Action
SOCIOECONOMICS AND QUALITY OF LIFE (Continued)							
Costs and Benefits and Local Government Fiscal Conditions	Substantial net beneficial impact due to payment of millions of dollars in royalties and taxes to state and local governments.	Largest net benefit of all alternatives due to highest royalty and tax payments.	Smaller net benefit due to less royalty and tax revenue.	Larger net benefit than Proposed Action, but less than Alternative A.	Smaller net benefit due to less royalty and tax revenue.	Larger net benefit than Proposed Action, but less than Alternative A.	Smallest net benefit.
Potential Impacts of another "Boom-Bust" Cycle	Employment increase and subsequent decrease would be small in the context of the overall local economy. Project's beneficial impacts would last beyond end of project due to financing of infrastructure.	Same as Proposed Action, although more jobs gained and eventually lost.	Same as Proposed Action, fewer jobs gained and eventually lost.	Same as Proposed Action, more jobs gained and eventually lost.	Same as Proposed Action.	Same as Proposed Action,.	Same as Proposed Action, although substantially fewer jobs gained and eventually lost.
Quality of Life	Adverse impact on citizens who value outdoor recreation; beneficial impact on those receiving higher wage employment and economic opportunity.	Greater impacts on outdoor recreation enthusiasts; greater higher wage employment and economic opportunity.	Less impacts to outdoor recreation enthusiast; less employment and economic opportunity.	Greater impacts on outdoor recreation enthusiast; greater higher wage employment and economic opportunity.	Less impacts to outdoor recreation enthusiast; less employment and economic opportunity.	Greater impacts on outdoor recreation enthusiast; greater higher wage employment and economic opportunity.	Less impacts to outdoor recreation enthusiast; less employment and economic opportunity.
HEALTH AND SAFETY							
Risk associated with well field construction and operations; pipeline leakage, rupture or explosion; and human-caused wildfires	Risks to employees, subcontractors, and the public would be similar to those associated with heavy construction and industry.	Similar to Proposed Action, although the probability of incidence would be slightly higher.	Similar to Proposed Action, although the probability of incidence would be slightly lower.	Similar to Proposed Action, although the probability of incidence would be slightly higher.	Similar to Proposed Action, although the probability of incidence would be slightly higher.	Similar to Proposed Action, although the probability of incidence would be slightly higher.	Similar to Proposed Action, although the probability of incidence would be slightly lower.

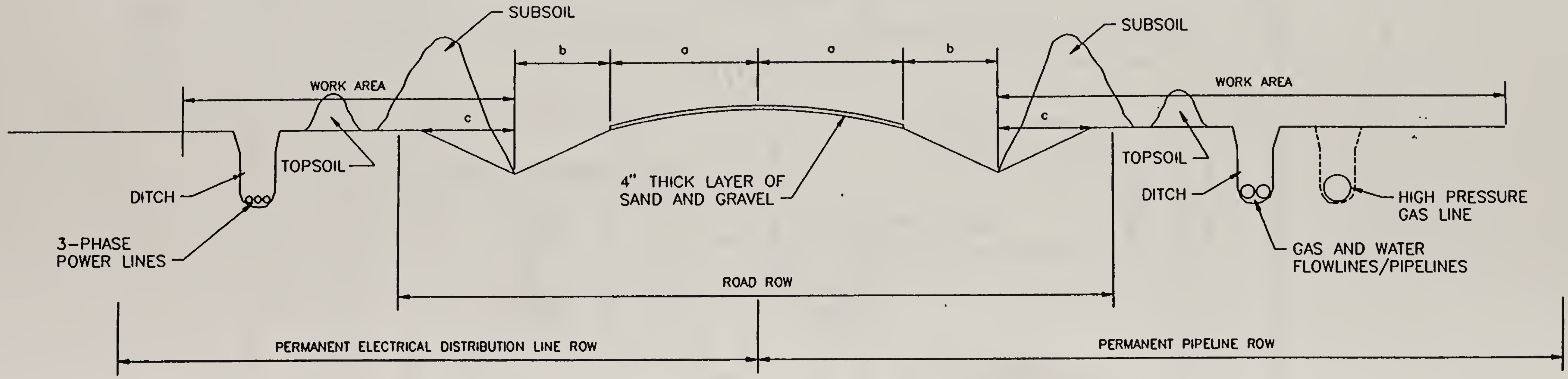
Chapter 3.0

Chapter 3.0
Tables

Chapter 3.0

Chapter 4.0

Chapter 2.0
Figures



NOT TO SCALE

	SURFACED TRAVELWAY WIDTH (ft)	a (ft)	b (ft)	c (ft)	APPROXIMATE DISTURBANCE WIDTH • (ft)	TOTAL ROW •• WIDTH (ft)
RESOURCE ROAD	16	8	4	4	67	77
LOCAL ROAD	20	10	5	5	75	85
COLLECTOR ROAD	24	12	6	6	83	93

• DISTURBANCE WIDTH INCLUDES 10 FEET OF DISTURBANCE FOR CONSTRUCTION/INSTALLATION OF FLOWLINES (GAS AND WATER PIPELINES) ON ONE SIDE OF THE ROAD AND 10 FEET OF DISTURBANCE FOR CONSTRUCTION/INSTALLATION OF UNDERGROUND ELECTRICAL DISTRIBUTION LINES.

•• INCLUDES AN ADDITIONAL 10 FEET (5 FEET FOR BOTH ELECTRICAL CABLES AND PIPELINES) FOR PERMANENT ROW.

Job No. :	23578	FIG. 2.2-1 PRICE COALBED METHANE. EIS TRANSPORTATION CORRIDOR (ACCESS ROAD, PIPELINES, ELECTRICAL DISTRIBUTION LINES)
Prepared by :	R.W.B.	
Date :	8/26/96	

23578002

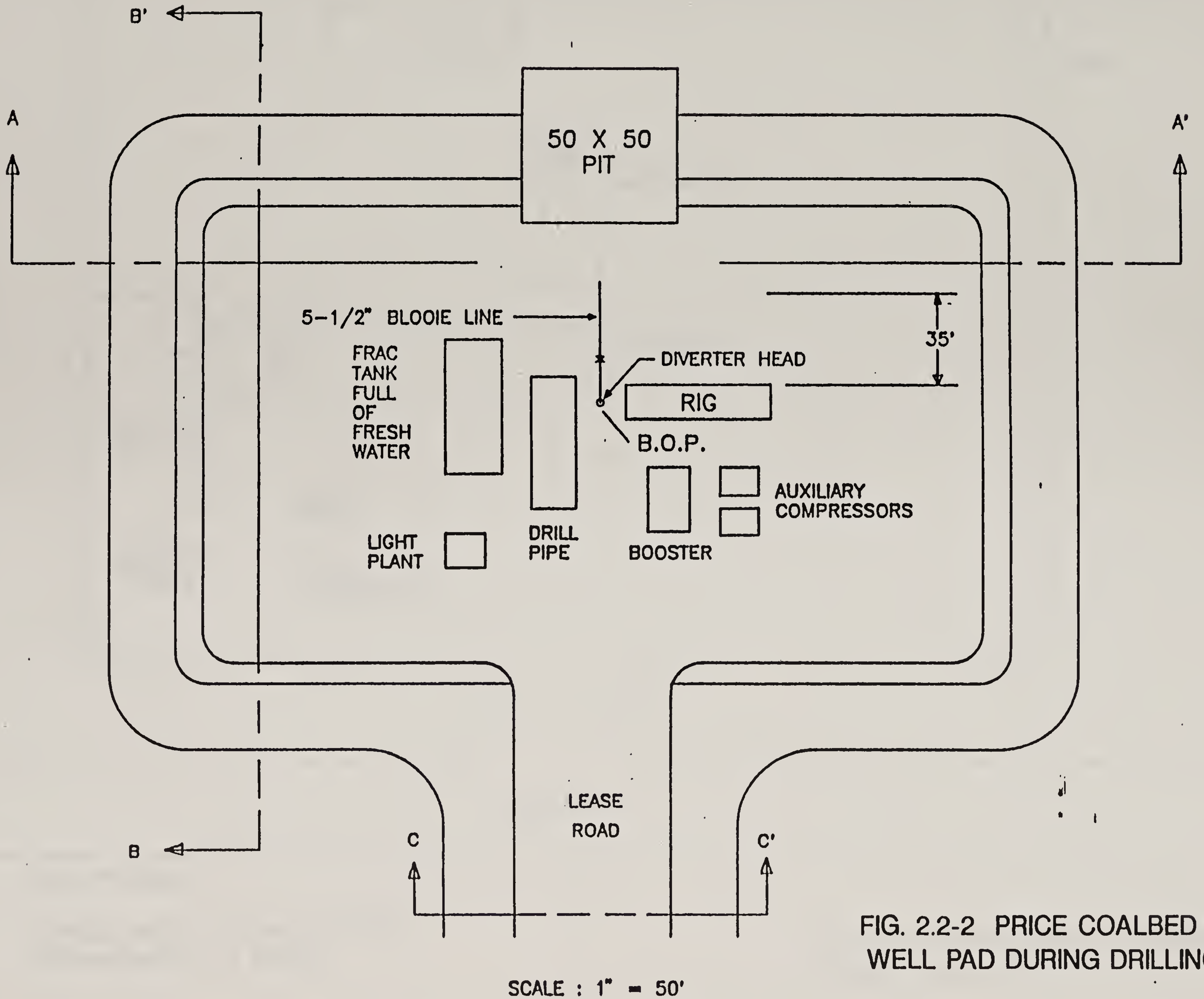
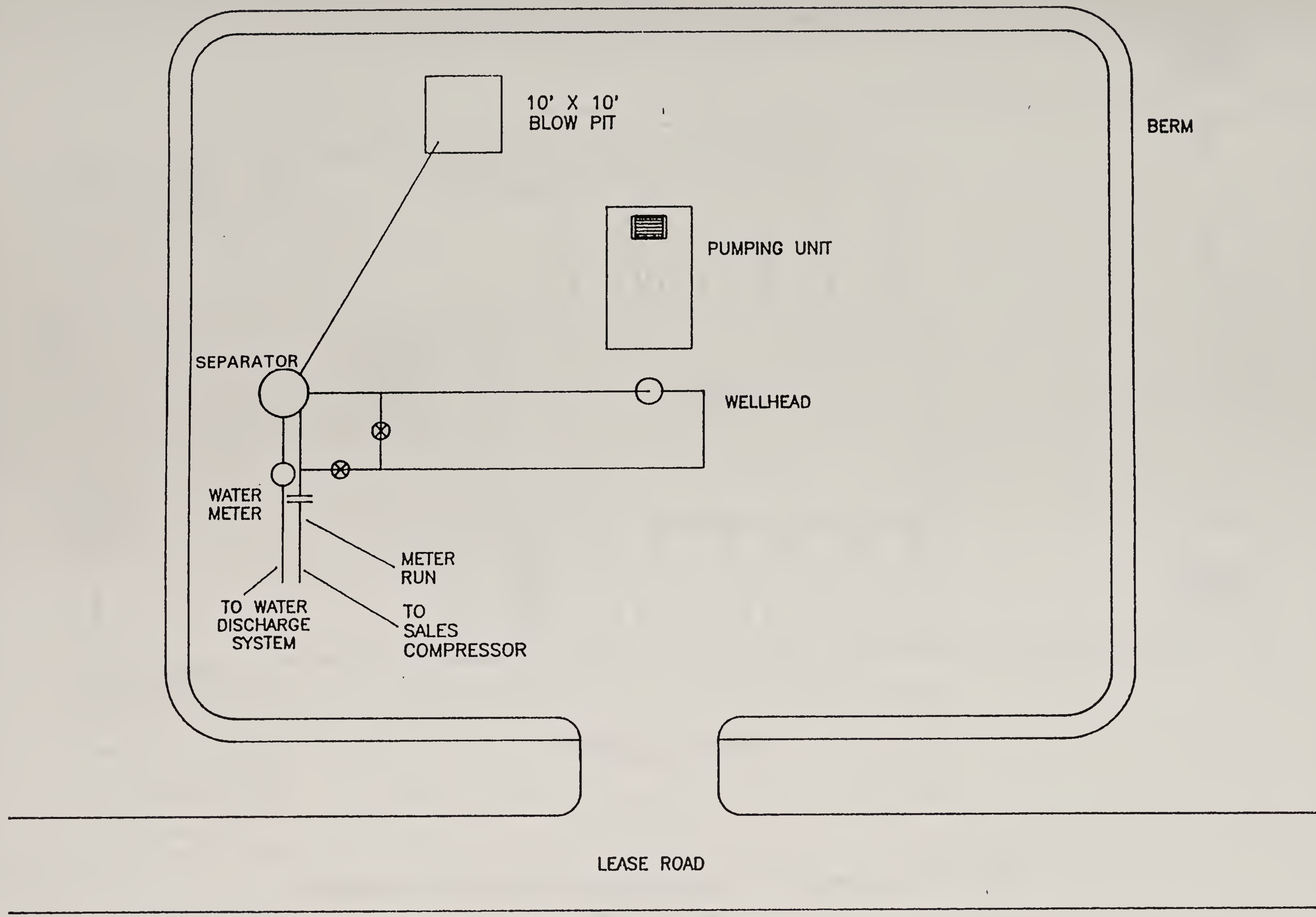


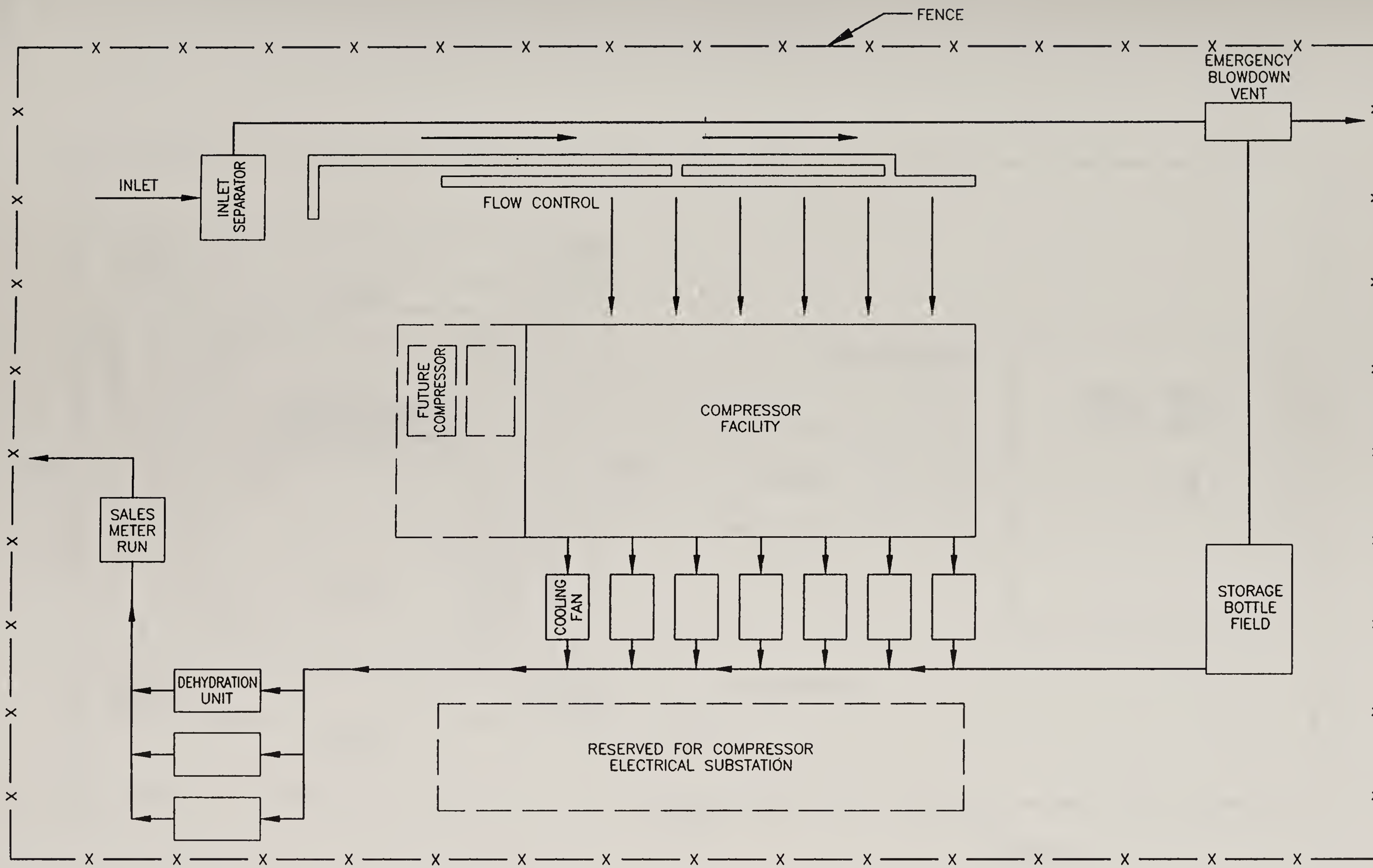
FIG. 2.2-2 PRICE COALBED METHANE EIS
WELL PAD DURING DRILLING ACTIVITIES



NOT TO SCALE

TYPICAL WELL SITE ENCOMPASSES
APPROXIMATELY 1.4 ACRES

FIG. 2.2-3 PRICE COALBED METHANE EIS
TYPICAL WELL SITE

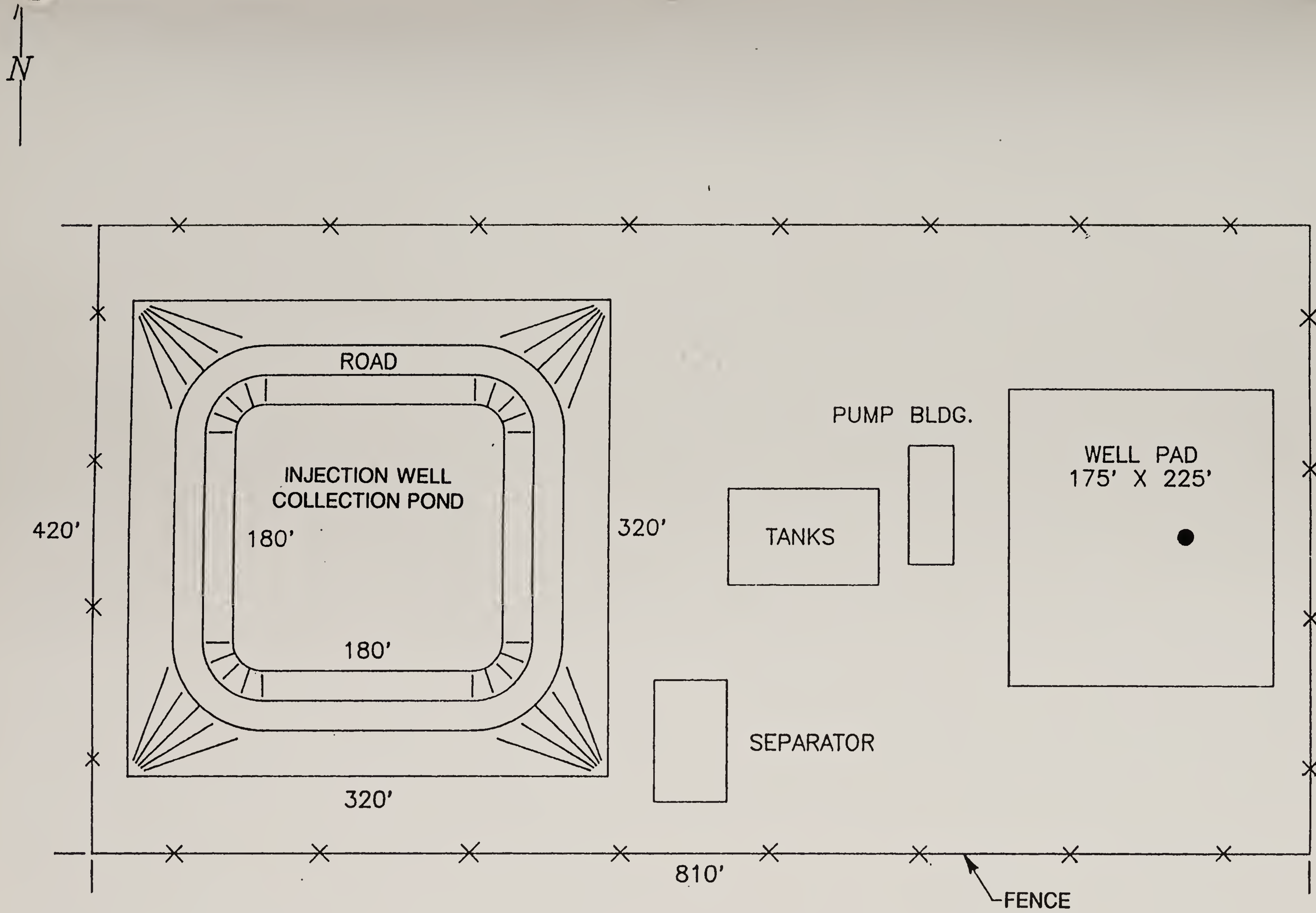


COMPRESSOR STATION SITE PLAN ENCOMPASSES APPROXIMATELY FIVE ACRES

NOT TO SCALE

Job No. : 23578	FIG. 2.2–4
Prepared by : T.R.S.	PROPOSED COMPRESSOR STATION SITE PLAN
Date : 8/26/96	

578001



DISTURBED AREA – 340,200 SQ. FT. (7.8 AC.)

FIG. 2.2-5 PRICE COALBED METHANE EIS
TYPICAL INJECTION (DISPOSAL) WELL SITE PLAN

utpod.dwg

The Affected Environment Chapter describes the present condition of the environment within the Project Area, prior to the initiation of the Proposed Action or any alternative. The material presented here has been guided by management issues identified by the BLM, public scoping, and by interdisciplinary field analysis of the Project Area. The affected environment is characterized for the following resource areas:

Geology	Cultural Resources
Water Resources	Land Use
Air Quality	Livestock Management
Soils	
Vegetation	Recreation
Wetlands	Visual Resources
Wildlife	Noise
Special Status Species	Socioeconomics
	Health and Safety

3.1 GEOLOGY

3.1.1 Regional Overview

3.1.1.1 Physiography and Topography

The Project Area is located in the northwestern corner of the Colorado Plateau physiographic province, within the Mancos Shale Lowlands Section of the Colorado Plateau (Stokes 1988). The Mancos Shale Lowlands is bounded by the Book Cliffs-Roan Plateau to the north, the San Rafael Swell to the southeast, and the Wasatch Plateau to the west. The Book Cliffs-Roan Plateau section is a linear system of erosional cliffs, including Book Cliffs, Roan Cliffs and Badland Cliffs (in Carbon County). These cliffs physiographically separate the Mancos Shale Lowlands from the Uinta Basin to the northeast (Stokes 1988). The San Rafael Swell is an anticline approximately 80 miles long and 30 miles wide. Rocks exposed by this uplift range in age from Paleozoic to Cretaceous (Stokes 1988). The Wasatch Plateau is capped entirely by sedimentary rocks and contains several zones of normal faulting that form long, narrow horsts and grabens. Joe's Valley, a notable feature within the Wasatch Plateau, is a graben that divides the Wasatch Plateau from northwest to southeast (Stokes 1988). The steep eastern margin of the Wasatch Plateau, which marks the western margin of the Mancos Shale Lowlands, is an erosional continuation of the Book Cliffs, and is not related to faulting.

The landscape of the Mancos Shale Lowlands is characterized by sloping, gravel-covered pediments, rugged badlands and narrow, flat-bottomed alluvial valleys (Stokes 1988). The most prominent topographic features in the vicinity of the Project Area are the Book Cliffs to the north and the western extension of these cliffs that mark the edge of the Wasatch Plateau. These escarpments are capped by erosionally resistant sandstones of the Price River Formation of the Mesaverde Group and drop away through the remaining members into the Mancos Shale below.

The eastern portion of the Project Area is relatively flat with some lower benches that rise 200 or 300 feet above the general ground level. The lowest elevation in the Project Area is where the Price River crosses the downstream boundary at an elevation of about 5,300 feet above mean sea level (amsl). The land rises westward from the Price River where it is dominated by benches and canyons. These benches, which typically rise 500 feet amsl to the east and from the canyon bottoms, are actually gravel covered pediments (Stokes 1988). Even further west,

steep cliffs rise above the Project Area to the Wasatch Plateau. These cliffs are a geographic extension of the Book Cliffs to the north and are capped by the Mesaverde Group. The highest point in the Project Area is along the western project boundary and is about 7,800 feet amsl. The maximum relief of the Project Area is about 2,500 feet.

3.1.1.2 Stratigraphy

Basic knowledge and understanding of the stratigraphic nomenclature and lithology of the area are necessary for meaningful discussions of geologic structures, mineral development and occurrence, groundwater occurrence and movement, geologic hazards, and topography and slope stability. Figure 3.1-1 provides a summary of stratigraphy and lithology of units that either crop out in the vicinity of the Project Area or are present in the subsurface. A map of the surface geology is presented as Plate 10. The following paragraphs describe only those units of particular importance to the proposed project and the description of the affected environment.

The Mesaverde Group forms the cliffs that border the Project Area to the west and north. The Mesaverde Group includes (from top to bottom as shown on Figure 3.1-1) the Price River Formation, Castlegate Sandstone, Blackhawk Formation, and the Star Point Sandstone. The Price River Formation, which tops the steep cliffs to the north and west of the Project Area, consists of gray to gray-brown sandstone beds irregularly interbedded with conglomerates and thin mudstone lenses. The Castlegate Sandstone Formation is a gray or white, quartzose sandstone, locally interbedded with thin conglomerate layers. The Blackhawk Formation is 700 to 1,000 feet of brown, thin to medium bedded, quartzose sandstones with shaley siltstone, shale, carbonaceous shale, and coal interbeds. This is the primary coal producing formation for this region. The Star Point Sandstone is a light brown to brown, quartzose sandstone with interbeds of shale and shaley siltstone. This unit, which generally forms the lowest part of the cliffs adjacent to the Project Area, intertongues with the underlying Mancos Shale, thinning and splitting into three smaller sandstone units east of Helper.

The Mancos Shale crops out over nearly the entire Project Area, with the exception of very small areas along the northwest and west Project Area boundaries where the Blackhawk Formation is exposed. The Mancos Shale, which ranges in thickness from 2,300 to 6,100 feet, consists of six members. The upper part of the Blue Gate Member is a slope-forming, light blue to dark gray shale and shaley siltstone, with minor thin sandstone beds. The Emery Sandstone Member consists of two cliff-forming sandstone units, which are fine grained, light brown quartzose sandstones averaging about 285 feet thick. These two sandstones are separated by a gray, thin bedded shale averaging 35 to 50 feet thick. The Blue Gate Member consists of light bluish or gray, thin bedded shales and shaley siltstones, which resembles the upper Blue Gate Member and is up to 2,000 feet thick. This unit is another slope former. The Garley Canyon Sandstone is a friable, cliff-forming sandstone ranging in thickness from 140 - 220 feet. The Ferron Sandstone Member, which has an average thickness of 160 feet, consists of alternating fluvial-deltaic sandstones and thick coals. These alternating beds were formed by a repeating series of wave and river dominated shorelines, delta plains, and bog/swamp facies (USDI, BLM 1994). Thus, the coals and sandstones are lenticular, discontinuous, and interbedded with siltstones, shales and mudstones. There are up

to 13 coal beds in the Ferron Sandstone, although most areas average only five coal layers (Tabet 1995a).

The coals average 4 to 9 feet thick, and net coal thicknesses can be up to 40 feet. These coals are the production target for the Price CBM Project. The Tununk Member is made up of light to dark gray, thin bedded shales and shaley siltstones and ranges in thickness from 400 to 650 feet. Beneath the Tununk Shale Member is the Dakota Group and Morrison Formation as shown in Figure 3.1-1.

The San Rafael and Glen Canyon Groups are the next geologic units of interest to this project. Injection wells would potentially be completed into the following formations: Curtis, Entrada, Navajo, and Wingate. The Curtis Formation and Entrada Sandstone are part of the San Rafael Group. The Curtis Formation is a light-gray to greenish-gray quartzose sandstone with thin beds of conglomerate. It ranges in thickness from 75 to 250 feet. The Entrada Sandstone is below the Curtis Formation and is an orangish-brown to light-brown, medium to thick bedded sandstone. It ranges in thickness from 200 to 300 feet.

The Glen Canyon Group includes the Navajo Sandstone, Kayenta Formation, and Wingate Sandstone. The Navajo Sandstone is a light brown to light gray, massive, crossbedded, quartzose sandstone which has a few thin limestones near the top of the formation. It ranges in thickness from 400 to 1,000 feet in the vicinity of the Project Area. The Navajo Sandstone is the approved disposal zone for water produced in the Drunkards Wash Unit. The Kayenta Formation is a lavender to reddish-brown, crossbedded, quartzose sandstone well cemented by calcium carbonate. It ranges in thickness from 100 to 250 feet and grades into the overlying and underlying units. The Wingate Sandstone Formation is a reddish-brown to brown, quartzose sandstone, well-cemented by calcium carbonate and averages from 350 to 450 feet thick.

3.1.1.3 Structure

Although the Project Area is situated between several significant structural features, the structure within the Project Area itself is quite simple. Strata in this region dip gently (5 to 10 degrees) to the north-northwest from the San Rafael Swell into the Uinta Basin to the north. The Gordon Creek Fault Zone, a system of normal faults, is located in the Wasatch Plateau west of the Project Area. A series of thrust faults are located east of the Project Area, southeast of Wellington.

The San Rafael Swell is a large, elongate anticline that is oriented in a southwest-northeast direction just south and east of the Project Area. Strata on the east flank of this structure dip as steeply as 80 degrees, whereas strata on the west flank dip a more gentle 5 to 15 degrees (Stokes 1988). There are oil and carbon dioxide reserves located at the northern tip of the anticline, where it plunges steeply. These reserves are located just outside the Project Area.

The Uinta Basin is a large, east-west trending, asymmetric syncline which lies to the northeast of the Project Area. Escarpments (the Book Cliffs) related to erosion, not to geologic uplift or faulting, separate the Uinta Basin from the Mancos Shale Lowlands. Similar erosional features mark the division between the Wasatch Plateau and the Mancos Shale Lowlands west of the Project Area.

The Gordon Creek Fault Zone is a series of northeast trending, high angle normal faults and fractures that are the easternmost of the

Wasatch Plateau fault zones (Tripp 1989). The Wasatch Plateau fault zones originated as the Great Basin geosynclinal belt subsided relative to the shelf area to the east in what was known as the Basin-and-Range Orogeny (Stokes 1988). The extensional forces that caused this subsidence allowed large blocks to drop along normal faults, thus forming the system of horsts and grabens that now define long narrow valleys, like Joe's Valley, on the Wasatch Plateau. It is generally thought that the down dropping of grabens began 40 million years ago and continues through the present. The Gordon Creek Fault Zone separates the Book Cliffs coal field from the Wasatch Plateau coal field.

The system of thrust faults southeast of Wellington trends northeast, paralleling the northern end of the San Rafael Swell (Waddell et al. 1981; Lines and Morrissey 1983). At the surface, outcrops of the Ferron Sandstone appear to be repeated among the traces of several of these thrust faults (Plate 10). Subsurface data indicate the possible presence of a thrust fault within the Project Area in Section 31 of Township 14 south, Range 10 east. Here 200 feet of the lower Ferron section is repeated (Tripp 1989).

Thrust faulting can enhance as well as decrease fracture permeability. The faulting action breaks up the rocks, which obviously enhances fracturing. At the same time, however, the compressive stresses that drive the upthrown side of the fault (hanging wall) over the downthrown side (footwall) are also acting to close any open fractures. Data from this area seem to indicate an overall increase in fracture permeability to gas (positive production anomalies) (Burns 1995).

3.1.2 Geological Resources

3.1.2.1 Oil

Oil production has not occurred within the Project Area to date despite oil shows reported within the Project Area in the Dakota Group, the Kaibab Limestone, and the Tununk and Ferron Sandstone Members of the Mancos Shale. Production of oil within the Project Area is not considered likely in the future although exploration may continue. There are five oil fields near the Project Area including the Flat Canyon Field, the Ferron Field, the Joe's Valley Field, the Grassy Trails Field, and the Indian Creek Field.

3.1.2.2 Conventional Natural Gas

Conventional natural gas reserves include "resources which may be produced at the surface from a well bore as a consequence of natural pressure within the subsurface reservoir; artificial lifting of oil from the reservoir to the surface, where economically applicable; and the maintenance of reservoir pressure by means of water or gas injection" (USGS, BLM, FS 1990). Conventional natural gas shows have been reported throughout the Project Area in both the Ferron Sandstone and the Dakota Group, including at the Gordon Creek and Miller Creek fields, although no production within the Project Area has been reported. Conventional natural gas is produced west of the Project Area in the Clear Creek and to the south in the Flat Canyon fields. The Clear Creek field produces from the Ferron Sandstone. The Flat Canyon Field, which includes both the East Mountain and the Indian Creek fields, produces from the Ferron Sandstone and from the Dakota Group.

Carbon dioxide production was established at the Farnham Dome field, to the east of the Project Area. Although more than 2 billion

cubic feet (bcf) of carbon dioxide was produced from that field, there is no production there currently. Within the Project Area, shows of carbon dioxide have been reported in the Coconino Sandstone, the Sinbad Member of the Moenkopi Formation, and the Kaibab Limestone. No carbon dioxide has been produced to date within the Project Area.

There is a potential for undiscovered conventional natural gas within the Project Area. Stratigraphic traps within or adjacent to the deltaic zones of the Ferron Sandstone have the highest potential for conventional natural gas reserves. New conventional natural gas reserves may also be found in the Dakota Group. There is also the potential to develop the existing Gordon Creek and Miller Creek fields, although it does not appear economically feasible to develop these reserves at this time.

3.1.2.3 Coalbed Methane

Coals in the Mesaverde Group and the Ferron Sandstone Member of the Mancos Shale contain coalbed methane (CBM) reserves. Within the Project Area, CBM is produced from the coals of the Ferron Sandstone, which are classified as high-volatile B bituminous in the northern part of the Emery Coal Field (Doelling et al. 1979).

CBM is produced along with water, carbon dioxide and nitrogen, as organic matter changes into coal (coalification). Some of the water and gasses become trapped as the coal seam is compacted. A coal seam is a dual porosity medium that consists of a solid matrix containing micropores and a natural fracture system known as cleats. Prior to production, gas-saturated water occupies the cleats, while the bulk of the gas remains adsorbed to the walls of the matrix micropores. CBM reservoirs can contain from three to seven times more methane than a conventional natural gas reservoir because of large internal surface areas (McElhiney 1989). Generally, higher ranked coals contain more trapped methane.

Adsorbed methane is produced from the coal by reducing the hydrostatic pressures (pressure exerted by water at any given point in a body of water at rest) within the formation. The reduced pressures allow the gas to desorb from the coal micropores into the cleat system and flow toward the portions of the formation with low pressure.

CBM projects usually reduce hydrostatic pressures by removing formation water. Several wells are drilled and water is produced until gas begins to desorb from the coal. Initially, large amounts of water are produced before gas can desorb and begin to flow to the well bore. As more and more gas desorbs and is produced at the well bore, less and less water is produced. Finally, gas production declines as water production remains low in the last stages of a well's production.

A portion of the Project Area (about 50 percent) is located within the Ferron Coalbed Gas Fairway, which extends from north of Price to south of Emery (Tabet 1995a). The Ferron Fairway is 6 to 10 miles wide and at least 80 miles long. "Ultimate recoverable reserves for the Ferron coalbed gas fairway are estimated at between 4 and 9 tcf" (UGS 1995).

Currently two fields produce CBM from the Ferron Fairway in or near the Project Area: The Drunkards Wash field (of which the Proposed Action is an expansion) and the Helper field. As of the end of 1995, there are 89 producing wells (and 8 coreholes) in the Drunkards Wash Unit and five in the Helper field. Plate 3 Proposed Action shows the approximate location of the existing CBM wells within the Drunkards Wash Unit of the Project Area.

3.1.2.4 Coal

Coal is not currently mined within the Project Area although some coals of the Ferron Sandstone may be considered mineable. Four principal coal fields are located in the vicinity of the Project Area: the Book Cliffs, the Wasatch Plateau, the Emery, and the Northern Emery. The Book Cliffs coal field is located to the north and east of the Project Area and mines the coals of the Blackhawk Formation. The Wasatch Plateau coal field is located west of the Project Area on the Wasatch Plateau. This coal field is also mined from the Blackhawk Formation. The Southern Emery coal field is located to the south of the Project Area and contains coal from the Ferron Sandstone Member of the Mancos Shale. The Northern Emery field is located in roughly the same place as the proposed project. Coal reserves in the Ferron Sandstone in this coal field have been estimated at 2 billion tons based on burial depths of less than 3,000 feet (Doelling 1972; Bunnel and Hollberg 1991).

There is concern that CBM production may preclude future exploration and development of other mineral reserves, especially mineable coal. It is generally understood that conventional natural gas, oil, and CBM production can occur simultaneously without any significant interference. However, the compatibility of CBM and coal mining is not so well established. CBM production involves the liberation of large amounts of methane from the coal seam. To coal miners, the presence of methane in the coal seam is a serious problem and requires significant investment to extract to allow mining to continue safely. By removing the water from the coal seams as part of CBM production the gas hazard to miners would be minimized. CBM production also typically involves the enhancement of fracture permeability by hydrofracturing the coal seam. Hydrofracturing involves injecting a fluid (usually water) and an inert sand into the coal seam at very high pressures so as to force open fractures temporarily with the pressure and to "prop" them open over the long-term with the inert sand.

3.2 WATER RESOURCES

3.2.1 Regional Overview

The majority of the Project Area is located within the watershed of the Price River. A small portion of the Project Area in the southwest is within the Huntington Creek watershed. The Price River traverses the northern portion of the Project Area flowing through the towns of Helper, Price and Wellington. The Price River Canyon topographically separates the Wasatch Plateau from the Book Cliffs. The majority of tributaries within the Project Area drain from portions of the Book Cliffs and Wasatch Plateau. Flow from the Book Cliffs is very small compared to flow from the Wasatch Plateau (Waddell et al. 1981). Huntington Creek flows just south of the Project Area into the San Rafael River. The Price and San Rafael Rivers drain into the Green River which eventually drains into the Colorado River.

Drainages within the western half of the Project Area are more likely to be perennial, or have flow year round, where they approach the higher elevations and amounts of precipitation typical of the Wasatch Plateau. There are four perennial streams in the Project Area: Miller Creek, Cedar Creek, Gordon Creek and the Price River. Perennial streams are identified on Plate 11 along with a 660-foot-wide buffer zone which is discussed in Section 4.2.

Similar to the distribution of perennial streams, there are more springs and seeps in the western half of the Project Area. There are springs at approximately 63 different locations west of the center of Range 9 East. and only 27 east of that same reference. This estimate was based on water rights information supplied by the Utah Department of Natural Resources, Division of Water Rights (UDNR 1995b).

Surface water quality also depends on proximity to the higher elevations and higher amounts of precipitation of the Wasatch Plateau. Regionally, the lowest total dissolved solids (TDS) concentrations occur at higher elevations and increase significantly as the streams flow away from the mountains across the saline soils of the Mancos Shale Lowlands.

The geohydrologic units of the Project Area have been categorized into six aquifers and five confining units. The six aquifers are the Quaternary alluvium (actually a group of discontinuous aquifers), the Mesaverde, the Dakota, the lower part of the Morrison, the Entrada-Preuss, and the Navajo-Nugget. The confining units are the Mancos, the upper part of the Morrison, the Curtis-Stump, the Carmel-Twin Peak, and the Chinle-Moenkopi (Freethey and Cordy 1991). Although the Ferron Sandstone member of the Mancos Shale is considered a supply of groundwater in some areas, it is not used as a supply of groundwater within or near the proposed Project Area.

These geohydrologic units are shown on the stratigraphic column in Figure 3.1-1, along with their associated stratigraphic description. Of all the geohydrologic units listed above, only five have any significant potential to be affected by the proposed CBM operation; the Quaternary Alluvium (potential for impacts from any pipe breaks or surface spills), the Ferron Sandstone (loss of water and lowering of head due to water production) and the Curtis Formation, the Navajo-Nugget aquifer and the Entrada Aquifer (increased head due to injection of water produced from the Ferron). Following discussions will focus primarily on these five units.

A trend in regional groundwater flow is from the Wasatch Plateau in the west toward aquifer outcrops and subcrops in the east. Recharge of the Ferron Sandstone occurs primarily along the fault zones of the Wasatch Plateau where precipitation is highest and extensional faulting allows for greater vertical recharge. Recharge to the Navajo Sandstone in the vicinity of the Project Area occurs along approximately 32 miles of exposed Navajo Sandstone on the west side of the San Rafael Swell (Weiss 1987). Groundwater flows through interconnected pore spaces in the formations as well as through fracture systems. Discharge occurs where aquifers are dissected by deep canyons and where aquifers subcrop against the alluvium of the larger creeks. Other than in the highly faulted areas of the Wasatch Plateau, there appears to be little vertical recharge or discharge between aquifers (Freethey and Cordy 1991).

3.2.2 Surface Water

3.2.2.1 Hydrology

Average annual precipitation in the project vicinity ranges from more than 40 inches at the higher elevations of the Wasatch Plateau (9,000 to 12,000 feet amsl) to less than 6 inches at the town of Green River (4,100 feet amsl). The area usually receives more than half of the total annual precipitation during the months from December through April. May and June are generally the driest months (Waddell et al. 1981).

Evaporation rates follow an annual pattern opposite to that of precipitation. The highest evaporation rates usually occur during June, July, and August, while the lowest evaporation rates occur during December, January, and February. More than 30 percent of the total annual evaporation occurs in July, whereas about 3 percent occurs during December, January, and February. Annual evaporation rates average 31 inches per year (Waddell et al. 1981).

The major streams and tributaries in the Project Area experience their highest flows during May, June and July, accounting for 50 to 70 percent of the annual stream flow. These peak flows are the result of melting snow that accumulates in the higher elevations from October through April (Waddell et al. 1981). The lowest flows occur during the winter months when streamflow is more dependent on bedrock discharge (Waddell et al. 1981). Many of the drainages in and near the Project Area are ephemeral, meaning they flow only in direct response to precipitation events such as thunder storms. In the absence of precipitation, these drainages contain only small stagnant pools or are dry altogether. Several of the streams and washes within the Project Area have 100-year floodplains as designated by FEMA. Refer to Section 1.6.2 for a discussion of floodplains.

Upstream from the Project Area, Price River streamflows average 109 cubic feet per second (cfs). Downstream from the Project Area flows in the Price River average 121 cfs. Flows in Huntington Creek average 74 cfs near the town of Huntington. The location of stream gaging stations and streamflow data for the Price River and for other USGS, UDWQ and UDOGM monitoring stations in the vicinity of the Project Area are presented on Plate 11 and in Table 3.2-1, respectively.

3.2.2.2 Surface Water Quality

As previously discussed, regionally the lowest TDS concentrations occur at higher elevations and increase significantly as the streams flow away from the mountains. The highly saline nature of the Mancos Shale, over which the streams flow in the lower elevations, is largely responsible for this change. The concentrations of TDS typically range from 100 to 250 mg/L at the headwaters of streams, whereas concentrations range from 1,000 to 6,000 mg/L in the lower reaches of the streams. TDS concentration data from the Price River for 1985 ranged from 323 mg/L near Helper to 1,193 mg/L downstream of Wellington. TDS concentrations in Huntington Creek ranged from 125 mg/L upstream to 3,950 mg/L downstream in 1976 (Waddell et al. 1981). The San Rafael River is typically slightly more saline than the Price River. TDS concentrations averaged 2,836 mg/L between 1989 and 1994 in the San Rafael River and 2,532 mg/L in the Price River at Woodside (Table 3.2-2). Surface water quality monitoring stations in the vicinity of the Project Area and available water quality data are presented on Plate 11 and Table 3.2-2, respectively.

Salinity standards have been adopted by the states of the Colorado River Basin for different locations on the Colorado River. These standards were set to protect water quality in the Colorado River from, in part, increased salinity due to return flow from agricultural lands. In essence, there can be no increase in salinity of waters flowing into the Colorado River. These standards apply to the Green River and to its tributaries. The standard at Imperial Dam near the Mexico-United States border is 879 milligrams per liter (mg/L). The BLM anticipates this standard will be exceeded by as much as 29 percent as a result of other projects in the Colorado River Basin, not including the Proposed Action (USDI, BLM 1990).

The type of dissolved constituents in the surface water also changes with elevation. Streams in the higher elevations of the Wasatch Plateau are typically calcium-magnesium type waters (i.e., the primary dissolved constituents are calcium and magnesium). As the streams flow across the Mancos Shale lowlands, both as natural flow and as irrigation return flow from highly locally saline soils, they change to sodium-sulfate type waters.

The quality of water in the Price River is protected for designated uses in accordance with the Utah water quality standards. The Price River and tributaries are designated as Class 3C (protected for nongame fish and other aquatic life) and Class 4 (protected for agricultural uses), from its confluence with the Green River to Castle Gate below the intake of the Price City wastewater treatment plant. The river and its tributaries from Castle Gate to its headwaters are designated as Class 1C (protected for domestic purposes with prior treatment), Class 3A (protected for cold water species), and Class 4. Surface water use and water rights are discussed in Section 3.2.5.

3.2.3 Groundwater

3.2.3.1 <u>Quaternary Alluvium</u>

The most accessible aquifers are in the area of the Quaternary alluvium which borders major creeks such as Miller Creek, Gordon Creek and the Price River. Alluvium is deposited by rivers and streams and is typically composed of a highly varied mixture of non-indurated (not bound or hardened by mineral cement, by pressure or by thermal alteration of the grains) gravel, sand, silt and clay. As a result of this textural variability, aquifer properties such as hydraulic conductivity can vary greatly. Hydraulic conductivities for alluvium can range from that of clay, 10^{-6} feet per day (ft/d) to that of gravel, 10^{4} ft/d (Freeze and Cherry 1979). The discontinuous nature of the alluvial deposits together with their inconsistent aquifer properties prohibit them from being considered a regionally continuous aquifer, even though they may be locally significant. The water produced with the CBM is being generated from the coal itself, which is not expected to have such widely varying conductivity values. Therefore, produced water quantities should not vary significantly within the Project Area.

3.2.3.2 <u>Ferron Sandstone Member</u>

The Ferron Sandstone Member of the Mancos Shale confining unit is considered the next most accessible aquifer in the area. The Ferron provides water for domestic uses far south of the Project Area, near the town of Emery, but is not widely used nearer to, or within, the Project Area due to marginal water quality and relatively great depth. Depths to the top of the Ferron Sandstone in the vicinity of the Project Area are estimated to range from 80 feet below ground surface near Wellington to 3,600 feet near Hiawatha (Lines and Morrissey 1983). The concentration of

TDS in water from the Ferron Sandstone ranges from 6,500 to 9,000 mg/L. Bicarbonate and chloride concentrations have been measured at 3,500 and 1,500 mg/L, respectively. Usable quality water is defined for oil and gas operations by 43 CFR 3162.5-3(d) as 5,000 mg/l or loss of TDS. By regulatory definition, the BLM does not consider water from the Ferron to be usable.

Similar to the alluvium, aquifer properties of the Ferron Sandstone are very heterogeneous due to its widely varying lithology. Areas where silty sands dominate the lithology are likely to have hydraulic conductivities of about 1 ft/d whereas areas where shale is the dominant lithology are likely to have hydraulic conductivities of about 10^{-6} ft/d (Freeze and Cherry 1979). The discontinuous and lenticular nature of the deltaic deposits together with the unit's highly heterogeneous aquifer properties prohibit the Ferron Sandstone from being considered a continuous regional aquifer.

3.2.3.3 Curtis Formation and Entrada Sandstone

The Curtis Formation is typically 25 to 75 feet thick, a glauconitic quartzose sandstone with thin beds of conglomerate (Doelling 1972, Stokes 1988 and Clark 1928). Although it is generally thought of as a confining unit, permeabilities are sufficiently high that RGC proposes to use it for a small portion of their injection fluids. The Entrada Sandstone Aquifer is approximately 200 to 300 feet thick and consists of medium to thick bedded sandstone (Doelling 1972, Stokes 1988 and Clark 1928). Neither of these units are used for groundwater supplies in the vicinity of the Project Area.

3.2.3.4 Navajo-Nugget Aquifer

The final geohydrologic unit of interest is the Navajo-Nugget aquifer. The Navajo-Nugget Aquifer is made up of the Navajo Sandstone, Kayenta Formation and Wingate Sandstone stratigraphic units. This geohydrologic unit is not important as a water source in the Project Area because of its poor water quality and great depth. However, the Navajo-Nugget Aquifer is used as a water source in areas close to its outcrop, where the water is of better quality.

Regionally, depths to this aquifer range from 2,000 to 12,000 feet (Freethey and Cordy 1991). Regional estimates of TDS in the Navajo-Nugget Aquifer range from 3,000 mg/L in the east to more than 35,000 in the west (Freethey and Cordy 1991). Locally, the Navajo Sandstone is found at depths exceeding 5,500 feet with TDS concentrations more than 172,000 mg/L (RGC UIC permit). The unit's depth and generally poor water quality within the Project Area make the Navajo Sandstone a suitable disposal zone for water produced by the CBM operation from the Ferron Sandstone.

RGC is currently permitted by UDOGM to inject produced water into the Navajo-Nugget Aquifer (Hunt 1995). Aquifer hydraulic conductivity was estimated to be 2 ft/day based on pre-fracture radial flow data in the injection well (RGC UIC permit). This value is consistent with other hydraulic conductivity values reported for silty sands (Freeze and Cherry 1979).

The UDOGM administers UIC permits in Utah. They have the authority to approve UIC permit applications based on federal and state laws, statutes and regulations. Any addition of new injection wells would be permitted through this agency.

3.2.4 Water Use

Water rights in the state of Utah are administered by the Utah Department of Natural Resources (UDNR). It is the authority of this agency to determine whether or not a water right application or an application to change an existing water right will be approved based on state laws and statutes, including those of the proposed project.

The Project Area is located within water rights areas 91, the Price River drainage, and 93, the Huntington Creek drainage. According to the UDNR, nearly all of the water within these two water rights areas has been appropriated (Page 1995). Only a small amount of water in the Green River within these two- water rights areas has not been applied for or filed. All of the surface water flowing through the Project Area has been appropriated (Page 1995). Most of the surface water in the region is diverted for agricultural purposes including irrigation and livestock watering. An illustration of the types of water usage for Carbon and Emery Counties compared to the water requirements for RGC's Proposed Action is given on Figures 3.2-2(a) and 3.2-2(b).

A water rights search was conducted for the area within the project boundaries and one mile outside the boundary. The water rights search reported 1,280 points of diversion of surface water sources. The most heavily appropriated surface water body is the Price River which had 379 points of diversion on record. Miller Creek and Gordon Creek had the next highest number of points of diversion on record, with 84 and 64 respectively. The water rights search also revealed that the primary use of surface water in the area is related to agriculture. Of the 1,280 points of diversion reported, 72 percent specified stockwatering and/or irrigation as the primary beneficial use for the water.

The water rights search identified springs at 90 different locations (UNDR 1995). Of these, 63 are located west of the center of Range 9E, and only 27 are located to the east. As with the surface water appropriations, the main use of spring flow is for agricultural uses. Several springs specified domestic use in their list of beneficial uses. Refer to Appendix 3A for water rights information on the identified springs.

A water rights search for wells within the Project Area and a one mile perimeter reported 276 points of diversion. Of these 276, RGC owns 220 for their existing CBM operation. It should be noted that many of these 220 RGC-owned points of diversion double up, i.e., there are two points of diversion reported for each well; one for groundwater and one for surface water. RGC's withdrawal of water from these wells is not considered a use of an aquifer and, therefore they are not considered in the remainder of this discussion. The search identified 56 wells that are not owned by RGC, none of which indicate a completion interval deeper than 250 feet. However, completion depths are not indicated for 25 of the 56 wells. Of these, four are located within or near the area where the Ferron is less than 250 feet deep. All four of these wells are located very close to the Price River, indicating that they are probably alluvial wells. The unit of completion for the remaining 21 non-RGC owned wells is unknown.

3.3 AIR QUALITY

3.3.1 Regional Overview

The air quality of a given region is determined by topography, distribution of sources of air

pollutant emissions and meteorology. This section presents information on the climate and air quality of the project region, as well as a brief overview of the regulatory requirements related to air quality permitting.

3.3.1.1 Climate

The proximity of the Wasatch Mountains exerts a strong influence on the climatology and meteorology of the area. Areas east of the Wasatch range are characterized by hot, dry summers, and cold, yet dry winters. Air movement at this latitude is predominantly from the west and north-west, year round. However, prevailing wind and dispersion patterns are modified by the complexity of the terrain. Significant diurnal drainage flows (slope and vālley winds) can be expected within the Project Area.

The Project Area is subject to prolonged and intense inversions, which occur in both winter and summer. Inversions are most severe in the winter when snow cover and shorter daylight hours combine to intensify the difference between cold air at the surface and the warmer air mass aloft. Inversions are more frequent and last longer in valleys where air movement is relatively restricted. The depth of the colder air defines the mixing height and determines the volume in which air pollution emissions are confined. Prolonged inversion conditions with low mixing heights create a buildup of pollutants confined in a smaller volume. During summer, the early morning inversions are generally dissipated by sunshine warming the air near the ground. During the winter, inversions may persist until a strong storm system moves through the region.

3.3.1.2 Regulatory Setting

The Clean Air Act (CAA) Amendments of 1977, Part D, Prevention of Significant Deterioration (PSD), require that certain new, major stationary sources and major modifications be subject to a pre-construction review, which includes an ambient air quality analysis. Such a review may apply to the operation of some of the compressor stations proposed for this project, depending upon their estimated emission. The air quality assessment includes an estimation of emissions, evaluation of control technologies and assessment of compliance with ambient air quality standards.

The Project Area is classified as a Class II attainment area under PSD regulations. Attainment status means that no state or federal standards are currently being exceeded. Class II PSD increments, applicable state, and federal ambient air quality standards are listed in Table 3.3-1.

Sources having emissions below the PSD major source thresholds are subject to New Source Review (NSR) permitting with the State of Utah. Such sources are required to demonstrate that they will not cause or contribute to a violation of the ambient air quality standards.

3.3.1.3 Air Quality in the Project Area

The Utah Department of Environmental Quality, Division of Air Quality, has statewide responsibility for monitoring air quality. Most monitoring is typically performed in areas where levels of air pollution are anticipated to be significant. There are no active monitoring stations in the vicinity of the Project Area. However, PM_{10} data (particulate matter of 10 microns or less

in size) can be obtained from the Sunnyside, Utah station. This is the nearest monitoring station to Price, Utah. Data collected from July 1994 to February 1995 are shown in Table 3.3-2. Concentrations ranged from 11 to 30 micrograms per cubic meter ($\mu g/m^3$) which are below the State and Federal 24-hour ambient air quality standards.The Midway site located in Carbon County, Utah, with an elevation and general exposure similar to the Project Area is expected to be representative of the project location. Meteorological data are collected hourly and can be summarized as follows. At Midway, horizontal winds are generally from the northwest during all seasons of the year. Average wind directions for each month of 1990 are depicted in Figure 3.3-1. Average and maximum wind speeds observed each month of 1990 are shown in Figure 3.3-2. Air temperatures vary considerably both diurnally and annually throughout the area with midsummer daytime temperatures in the area commonly exceeding 80°F and midwinter night-time temperatures throughout the area commonly below freezing. The temperature extremes measured at Midway in 1990 are a maximum of 95°F during August, and a minimum temperature of -29°F in December.

The general air quality in the Carbon and Emery County region is expected to be good to excellent because of the remoteness of the area, and distance from major urban population centers. The area is in attainment of the Ambient Air Quality Standards (AAQS) for all criteria pollutants.

Regional visibility in the Project Area is generally good. The EPA VISCREEN user's guide estimates the background visual range to be between 68 to 106 miles (110 and 170 kilometers).

3.4 SOILS

3.4.1 Regional Overview

Ten general soil mapping units, comprised of 18 soil series, were delineated within the Project Area (Table 3.4-1). Soils in the Project Area occupy varying landforms including narrow valleys, rolling hills, and high mountains with very steep sideslopes. Elevations range from about 5,000 to 7,800 feet, and slopes range from 0 to 70 percent. At the base of the Book Cliffs on the northern boundary and along the western portion of the Project Area are rolling hills to steep mountains with shallow to very deep soils. On outwash plains, the soils have formed in alluvium, colluvium, and glacial outwash derived dominantly from sandstone, shale, and quartzite. The soils on the mesas, benches, and the sides of mesas have formed in residuum and colluvium derived dominantly from sandstone and shale.

The very deep soils on valley floors and alluvial fans along the Price River, Miller Creek, and along the county line have formed in alluvium derived dominantly from sandstone and alkaline, gypsum-bearing marine shale. On the gently sloping to moderately steep shale hills surrounding the valley floors, the shallow soils have formed in residuum and alluvium derived dominantly from shale and sandstone.

The soils on the upper slopes and crests of gently rolling hills and the intermingled narrow valleys north of Elmo are shallow to moderately deep. These calcareous soils have formed in residuum that weathered from alkaline, gypsum-bearing marine shale, and residuum that weathered from clayey marine shale bedrock.

General and detailed soils information was obtained in a review of the *Soil Survey of Carbon-Emery Area, Utah* (USDA, SCS 1970) and the *Soil Survey of Carbon Area, Utah* (USDA, SCS 1988). Soils maps showing the distribution of the various soil mapping units, physical characteristics of the soils, and major land uses are detailed in these documents and are summarized below for the soil mapping units within the Project Area.

3.4.2 Soil Characteristics

In order to assess potential impacts to soil, detailed soils maps and data were used to identify soils with a high erosion potential, high to very high saline levels, and soils unsuitable for use as reclamation material. Appendix 3B lists the one-hūndred and twelve soil mapping units that occur within the Project Area. The physical characteristics relative to determining impacts due to the Proposed Action and alternatives are also included.

Erosion

Erosion is most likely to occur when all or most of the protective plant cover is removed and rainfall washes the topsoil away, which, in turn, can increase sedimentation of down gradient rivers, streams and creeks. The Soil Surveys indicate the potential for water erosion is high to severe for 38 percent (71,994 acres) of the soils in the Project Area (Plate 12). In most instances, these are loams and silty clay loams intermixed with barren shale, rubbleland or rock outcrop found widely distributed throughout the Project Area. Surface runoff from the barren material is rapid and the shallow soils with low permeability are easily eroded.

Soils in the Project Area that occupy steep slopes are more susceptible to erosion because the potential for erosion increases with increasing slope steepness. Within the Project Area, 81 percent (151,980 acres) of the area has slopes ranging from 0 to 10 percent; 16 percent (30,642 acres) has slopes ranging from 10 to 30 percent; 2 percent (4,408 acres) has slopes ranging from 30 to 50 percent; and about 1 percent (1,211 acres) has slopes greater than 50 percent.

Furthermore, 35 percent (66,064 acres) of the Project Area is currently undergoing accelerated erosion due to runoff from occasional summer storms of high intensity, water escaping from broken irrigation canals, or waste water from irrigation that has formed gullies averaging 3 to 10 feet deep, and 100 to 300 feet apart (USDA, SCS 1970).

Erosion potential is rated moderate for 54 percent (101,780 acres) of the soils in the Project Area. Generally, these are loams and silty clay loams on nearly level to gently sloping hills throughout the Project Area. These soils have a moderate to high percentage of organic matter and, therefore, a higher moisture holding capacity. This can reduce erosion potential and promotes revegetation and reclamation. Only 8 percent (14,476 acres) of the soils in the Project Area are rated low for erosion potential, and are generally found along the Price River and Miller Creek. These soils are loams, silt loams, and silty clay loams on nearly level to gently sloping hills with a much higher rate of permeability and organic matter content. Disturbance of these soils is unlikely to result in increased erosion.

Wind erosion is most likely to occur in areas of arid climates such as those at lower elevations of the Project Area. When the vegetative cover is removed, soils high in fine textured material are easily transported by wind. This results in the displacement or loss of topsoil, increased sedimentation, and impacts to ambient air quality from elevated dust levels (Section 4.3).

About half of the soil series in the Project Area have a moderate potential for wind erosion, including most of the soils in Carbon County. The remainder have a low potential for wind erosion. The Natural Resource Conservation Service (formerly the Soil Conservation Service [SCS]) does not rate any of the soils in the Project Area with a high or severe potential for wind erosion.

Salinity

Saline soils (soils containing soluble salts in quantities that impair its productivity for plants) are naturally occurring throughout the Project Area. Saline soils are common in arid regions where inadequate rainfall means there is little or no chance for the excess salts to be leached from the soil. Within the Project Area highly saline soils occur in the nearly level areas that frequently have a high water table, parent material derived from gypsum-bearing marine shale (with accumulated salts) or are fine textured. These conditions reduce the movement of water downward and make it difficult to leach excess salts. When the salt is not leached from the soils through frequent rainfall or irrigation, it is carried upward with water as it evaporates and salts accumulate on the soil surface.

Saline soils pose two potential concerns:

- Reclamation - Highly saline soils force plants to exert more energy to absorb water, which is usually most damaging to young plants. High concentrations of salt can also affect plant growth by pulling water from plants, and by holding the water in the soil making it more difficult for plant roots to extract the moisture.
- Erosion of saline soils and increased sedimentation in local streams and rivers. In general, salinity and erosion potential are low for the soils adjacent to the Price River and Gordon Creek. However, many of the streams and creeks that feed into them are susceptible to erosion and sedimentation of high to very highly saline soils. The 1972 Federal Water Pollution Control Act, as Amended (P.L.92-500) prohibits adding salts into rivers and lakes.

Four percent (7,865 acres) of the soils delineated within the Project Area are rated very high for salinity (greater than 16 millimhos per centimeter [mmhos/cm]). The very highly saline soils would be more difficult to reclaim and would likely require revegetation with plant species specifically selected for salt tolerance (Appendix 2F). Additionally, aggressive erosion control measures would be necessary to prevent increased salt loading of regional waters. Most of the very highly saline soils are found in eastern Emery County, with a few small areas scattered throughout eastern Carbon County (Plate 13).

Soils rated moderately to highly saline (4-16 mmhos/cm) occupy 39 percent (73,082 acres) of the Project Area, mostly in the eastern half. These soils would be easier to reclaim, but aggressive erosion control measures are still warranted. Fifty-seven percent (107,303 acres) of the soils are low in salinity (less than 2 mmhos/cm). These soils are primarily found on the western half of the Project Area at higher elevations. Chances for successful reclamation are much greater, and the potential for increased salinity of regional waters would be negligible.

Quality of Reclamation Material

Soils of the Project Area represent a source of cover material for the reclamation of disturbed areas. The potential for each soil series to be used as cover soil in reclamation was evaluated based on physical and chemical characteristics and the criteria shown in Table 3.4-2. Coversoil suitability ratings for each soil series are shown in Appendix 3B.

Within the Project Area, the most limiting factors are: (1) areas of rock outcrops, barren shale, and rubbleland with little or no soil material, (2) excessively saline soils (greater than 16 mmhos/cm) and, (3) gullied lands.

Rock outcrops, barren shale, rubbleland, and riverwash are rated unsuitable for reclamation material because there is little or no soil material available. Seven percent (12,532 acres) of the Project Area is considered unsuitable as a source of reclamation material. These unsuitable areas are distributed throughout the Project Area, but are most notable along the Price River where riverwash is exposed when the water level is low. These areas are subject to deposition and erosion when the water level is high, and support little if any vegetation. Another significant portion of this group is Badlands. These are steep to very steep areas of barren shale associated with the Mancos Shale Formation which are currently undergoing active geologic erosion.

Gullied lands and soils with very high saline levels are rated poor for use as reclamation material due to the increased difficulty of reclamation. As noted above, these areas will require implementation of good erosion control measures and revegetation with salt tolerant plant species. Thirty-nine percent (73,121 acres) of the Project Area is rated poor for providing reclamation material. Again, the poor rating applies primarily to the eastern half of the Project Area. Fifty-four percent (102,598 acres) of the soils in the Project Area will provide fair to good quality material for reclamation activities (Plate 14).

The most sensitive soils will be in areas where there is a combination of the characteristics discussed above. Plate 15 shows where these characteristics overlap within the Project Area. Soils with a high erosion potential combined with those unsuitable for reclamation material occur on 3 percent (5,277 acres) of the area. Soils with a high erosion potential combined with highly saline soils occur on 14 percent (26,372 acres) of the Project Area.

3.5 VEGETATION

3.5.1 Regional Overview

The Project Area is located in the Canyonlands floristic section of the Intermountain Region (Cronquist et al. 1972). About 90 percent is in native vegetation, mostly sagebrush/grass, salt desert (saltbush-greasewood), and pinyon-juniper woodland.

The eastern half is mostly level or rolling terrain with low benches and the Price River Valley, and ranges in elevation from about 5,400 to about 5,900 feet. The vegetation consists of a matrix of salt desert in uncultivated areas, together with large patches of irrigated agricultural lands and riparian and wetland vegetation. Several urbanized areas are located in the northern portion of the eastern half, including Price, Wellington, Carbonville, and Spring Glen.

The western half consists of a complex of benches, valleys and hills, ranging from about 5,900 to 7,800 feet elevation. Sagebrush-grass occurs throughout on loamy soils and more level sites, while pinyon-juniper woodland occupies steeper slopes and shallow or rocky

soils. Riparian and wetland communities occur along some streams.

The northern and eastern boundaries of the Project Area reach portions of the Book Cliffs and the edge of the Wasatch Plateau. Small areas of montane and subalpine forest, mountain shrub, and barren land occur mostly in these areas.

3.5.2 Vegetation Types

The distribution of vegetation types within the Project Area is provided in Plate 16. Table 3.5-1 provides a summary of acres by vegetation type. Plate 16 was prepared using a combination of existing vegetation mapping, aerial photography interpretation, and limited ground reconnaissance. The primary source was GAP data from the State of Utah's Automated Geographic Reference Center, which consisted of vegetation maps prepared from satellite imagery. The existing data were modified by lumping GAP types and by making corrections based on interpretation of aerial photographs and field observations.

Each of the vegetation types is described below. Within types, there are variations in soils and associated factors such as topographic position, precipitation, and elevation which result in differences in potential species composition and primary production. Actual composition and production vary based on land use history and climatic conditions.

Sagebrush/grass

The sagebrush/grass type dominates the western half of the Project Area with scattered locations throughout the eastern half. This is the largest community and comprises 79,419 acres (42.2 percent) of the Project Area (Table 3.5-1). This type mostly occurs in semi-arid areas (10- to 14-inch precipitation) on gently sloping (1 to 8 percent) terrain with deep loamy soils, including benches, terraces, alluvial fans, and valley floors from about 5,700 to 7,500 feet. It includes the sagebrush, sagebrush-perennial grass, grassland, and dry meadow cover types from the GAP data.

This vegetation type is characterized by an overstory of sagebrush and understory of grasses, forbs and smaller shrubs. Big sagebrush is the most common shrub, typically forming about 30 percent cover. Other shrub species include broom snakeweed, little rabbitbrush, pinyon pine, prickly pear cactus, curl-leaf mountain mahogany, ephedra, fourwing saltbush and winterfat. Black sagebrush is the dominant browse species in the Poison Springs Bench, which lies in the southwestern portion of the Project Area. Common grasses include blue grama, bottlebrush squirreltail, Indian ricegrass, needle and thread, western wheatgrass, and slender wheatgrass.

Approximately 10 percent of the mapped area of sagebrush/grass consists of former pinyon-juniper woodlands that were chained in the 1970s, on Poison Springs Bench, Horse Bench, Pinnacle Bench, and a few other areas. Crested wheatgrass, big rabbitbrush, and fourwing saltbush have been seeded in these areas as supplemental forage for domestic livestock and big game.

Salt Desert

Salt desert vegetation occur mainly in the eastern half of the Project Area. It occupies 50,257 acres (26.7 percent), and is the second most widespread vegetation type in the Project Area. This type occurs in arid areas (6- to 10-inch precipitation) on shale hills, alluvial fans, and valley floors at elevations of about 5,400 to 5,900 feet in the Project Area. Sparsely vegetated badlands are present in some areas,

and large areas are eroded or gullied. This type includes the salt desert scrub, desert grassland, and greasewood cover types from the GAP data.

This vegetation type is dominated by perennial chenopod shrubs and half-shrubs, and is also known as saltbush-greasewood. Dominant species include shadscale on uplands, mat saltbush and Nuttall saltbush on hills, and black greasewood and big rabbitbrush in saline bottom and along washes. Other characteristic species include Castle Valley saltbush, budsage, horsebrush, snakeweed, and winterfat. Major native grasses include galleta grass, Indian ricegrass, sand dropseed, and alkali sacaton. Extensive areas are dominated by the introduced cheatgrass (Intermountain Ecosystems 1995).

Pinyon-Juniper Woodland

Pinyon-juniper woodlands occur in the western half of the Project Area and in the area north of Price. This plant community is dominated by dwarf conifer trees - juniper at the lower elevations (about 5,500 to 7,000 feet), and pinyon at higher elevations (>7,000 feet). Pinyon-juniper accounts for approximately 33,167 acres (17.6 percent) of the Project Area (Table 3.5-1). It occurs primarily in semi-arid areas (10- to 14-inch precipitation) on shallow or rocky soils on benches and mesas, mountain slopes, side slopes of benches, and outwash plains.

The junipers and pines are similar in height: 52 to 85 feet at maturity. The tree crowns rarely touch in these open woodlands, and form a canopy cover of 15 to 30 percent. Tree height and density are higher on more favorable and higher elevation sites. The understory varies greatly in pinyon-juniper woodlands. Big sagebrush is common and found in woodland openings in deep, loamy soil. Black sagebrush and mountain mahogany are often the dominant understory shrubs in the pinyon-juniper woodland on shallow, lithic soils. Snakeweed and little rabbitbrush are often found in poor range conditions or unsuccessful range improvement areas. Common grasses include Sandberg bluegrass, needleandthread, Indian ricegrass, squirreltail and western wheatgrass. Common forb species include stemless golden weed, oval buckwheat, yellow-eye cryptantha, scarlet gilia, dwarf cateye, brittle pricklypear cactus, claretcup cactus, and heartleaf twistflower (Intermountain Ecosystems 1995).

Riparian/Wetland Communities

Riparian and wetland communities occur along the Price River, adjacent to canals and agricultural areas, and at scattered locations along smaller streams. This community accounts for 5,209 acres (2.8 percent) of the Project Area (Table 3.5-1) and is located mainly on private land.

Wetlands are those areas which are inundated or saturated with water at or near the surface of the soil for a sufficient duration during the growing season to develop characteristic soils and vegetation. Riparian communities are those developed in response to the influence of soil moisture and microclimatic regimes that are the direct result of influences from streams and other water bodies. Riparian areas may include both wetlands and non-wetlands. The riparian ecosystem is considered valuable for providing wildlife and fisheries habitat, maintaining water quality, stabilizing stream banks, providing flood control, and scenic and aesthetic values. Riparian and wetlands areas are analyzed together in this EIS because they overlap in characteristics, and because detailed information on occurrence of each as separate categories is not available.

Most of the areas of riparian and wetland vegetation occur in the eastern half of the Project Area, adjacent to and downstream of agricultural areas. Sources of water include seepage from ditches and canals, irrigation runoff, subirrigation, and ponding on poorly drained soils. Many of the areas are wet or saline meadows, and have high water tables throughout much of the year, and many are saline. Common species include Baltic rush, saltgrass, alkali sacaton, sedges, and redtop. Areas with somewhat deeper water tables are dominated by greasewood, saltgrass and kochia (USDA, SCS 1988). Trees such as tamarisk, cottonwood and elms are present in some areas.

Riparian shrublands are present on alluvial fans and stream terraces of the Price River valley floor in the northeastern portion of the Project Area. Lower areas have seasonally high water tables and are subject to brief periods of inundation, while higher areas are dry. Common species include tamarisk, willows, saltgrass, sedges, cottonwood, skunkbush sumac, and rabbitbrush (USDA, SCS 1988).

Riparian plant communities occur along other perennial streams and are best developed in the pinyon-juniper woodlands. Perennial streams such as Cedar and Gordon Creeks are examples of desert riparian streams with narrow floodplains and riparian vegetation. Fremont cottonwood, narrowleaf cottonwood, elm, Russian olive, tamarisk, copperweed, sandbar willow, salt cedar, saltgrass, and horsetail are often found along the stream channels while big sagebrush, greasewood, big rabbitbrush and squawbush are found on the narrow floodplains (Intermountain Ecosystems 1995).

The BLM has mapped riparian areas on areas of federal surface land ownership within the Project Area. Larger areas (10+ acres) of cottonwood and tamarisk riparian areas are mapped along portions of Gordon Creek and its north and south forks, Haley Canyon, Miller Creek, Serviceberry Creek, Price River, and North Spring Canyon, and perennial and annual forbs and grass riparian along portions of Washboard Wash and Sand Creek. Small areas (mostly < 1 to 5 acres) of riparian vegetation, mainly tamarisk, are scattered in a number of drainages.

Mountain Shrub

Mountain shrub occurs at scattered locations in the northwestern corner of the Project Area and along the edge of the Wasatch Plateau. The total acreage of mountain shrub within the Project Area is about 433 acres (0.2 percent). This type includes the oak and mountain shrub cover types from the GAP data.

This type is dominated by tall deciduous shrub species including serviceberry, Gambel oak, curlleaf mountain mahogany, cliff rose, snowberry, chokecherry and ceanothus. Common grass species include Letterman needlegrass, bluegrass, Indian ricegrass, western wheatgrass, and slender wheatgrass. The height of the shrub cover is 3 to 16 feet, depending on species, site, and recent fire history.

Montane/Subalpine Forest

Montane and subalpine forests occur at a number of locations near the western edge of the Project Area and the eastern edge of the Wasatch Plateau. This type includes the ponderosa pine, lodgepole pine, aspen, ponderosa pine/mountain shrub and spruce-fir/mountain shrub cover types from the GAP data. Altogether they cover 379 acres, or 0.2 percent of the Project Area. They occur primarily on steep and/or sheltered north and east-facing slopes. Species present include ponderosa pine, lodgepole pine, pinyon,

juniper, aspen, blue spruce, Gambel oak, snowberry and other mountain shrub species.

Barren

Sparsely vegetated cliffs and slopes are found at several locations on the Book Cliffs and similar geologic formations on the edge of the Wasatch Plateau. They account for only 294 acres (0.2 percent) of the Project Area.

Agriculture

Irrigated agricultural lands are scattered throughout the eastern half of the Project Area, primarily east of Highway 10, and cover approximately 15,478 acres (8.2 percent) of the Project Area. Primary agricultural uses are alfalfa, small grain, irrigated pasture, and corn for silage (USDA, SCS 1988).

Urban

Urban areas include communities such as Price, Wellington, Carbonville, and Spring Glen, and areas disturbed by mining and industrial activity. The urban type covers 3,593 acres (1.9 percent) of the Project Area.

3.5.3 Noxious Weeds

The Utah Noxious Weed Act defines noxious weed as any plant which is determined by the Commissioner of Agriculture to be especially injurious to public health, crops, livestock, land, or other property. Seventeen species have been designated as state noxious weeds, and fifteen have additionally been classified as new and invading weeds which have the potential to become noxious weeds. Each county weed control board has the authority to develop its own list. Each property owner has the responsibility to control noxious weeds on lands in his possession or under his control. County Weed Boards may issue an individual notice requiring control of noxious weeds on a particular property, and can cause weeds to be controlled with all expenses to be paid by the person in the possession of the property. The Utah Noxious Weed Act also requires that machinery be cleaned of noxious weeds before being brought into the state, and prohibits selling or distributing seeds, hay, manure, soil, sod or nursery stock containing noxious weed seeds.

State designated weeds are Bermuda grass, field bindweed, Canada thistle, diffuse knapweed, dyers woad, hoary cress (whitetop), leafy spurge, medusahead, musk thistle, perennial pepperweed (tall whitetop), quackgrass, Russian knapweed, Scotch thistle (cotton thistle), spotted knapweed, squarrose knapweed, and yellow starthistle. New and invading species include black henbane, camel thorn, Dalmatian toadflax, goatsrue, jointed goatgrass, poison hemlock, purple loosestrife, purple starthistle, silverleaf nightshade, St. Johnswort, velvetleaf, water hemlock, wild proso millet, yellow nutsedge, and yellow toadflax. Carbon County has listed dyers woad as a county noxious weed, and Emery County has identified other problem weeds in the county as houndstongue, whorled milkweed, buffalobur, and chicory.

Carbon County has a variety of noxious weeds that occur throughout the county such as Canada thistle, musk thistle, bindweed (wild morning glory), and quackgrass (Soper 1995). Small infestations of Russian knapweed have been found around Price and a major infestation occurs south of East Carbon City. White top has small infestations in the Price, Helper, and Spring Glen areas. Small infestations of Scotch thistle, dyer's woad, and leafy spurge have been found in the East Carbon City area, Helper area, and Nine Mile Canyon respectively.

Emery County also has infestations of musk thistle and Russian knapweed as well as spotted knapweed, diffuse napweed, and dalmatian toadflax. Buffalobur is another weed of concern but is not identified as a noxious weed (Worwood 1995).

Gas field developments in the Project Area have had minor noxious weed problems in the recent past. A few musk thistle plants were observed and treated by Carbon County weed control personnel in 1995 and 1996 on both RGC and Anadarko facilities (Wise 1996). Gas production facilities are not regularly inspected for noxious weeds by either RGC or Carbon County personnel. Some noxious weed problems have occurred in Emery County from other oil and gas operations in the Buzzard Bench and Cottonwood Wash areas, where musk thistle has required control on some access roads and around well pads (Nielson 1996).

3.5.4 Revegetation

Much of the Project Area has significant limitations for re-establishment of vegetation, including climatic factors such as low and irregular precipitation; soil factors such as shallow depth, high erosion potential, high salinity, steepness and rockiness; and biotic factors such as potentially high livestock and wildlife use and competition from invasive weeds. Other factors affecting success of revegetation include selection of appropriate species and cultivars, mulching, fertilizing, proper seedbed preparation, good implementation and management, and monitoring and retreatment.

A map of reclamation potential based on soil characteristics is presented and discussed in Section 3.4.

The eastern half of the Project Area is arid (less than 10 inches of precipitation per year), and natural moisture may be sufficient for good vegetation establishment in salt desert vegetation only in years of above normal precipitation or other favorable conditions. Re-establishment of vegetation in agricultural, riparian and wetland areas will not be limited by precipitation, and should be successful in any year. The western half of the Project Area has higher precipitation (10 inches or more), which normally will be adequate for seedling establishment.

A seeded area may require 2 to 5 years for grasses and forbs to become established, and shrubs may take 10 to 15 years or longer. Seeded areas are usually more attractive to livestock and wildlife than the surrounding undisturbed areas, and heavy use could damage or eliminate newly established shrubs and grasses, unless they are protected by fencing. Much of the Project Area is used for livestock grazing (Section 3.11), and large portions are critical or high value big game wintering range (Section 3.7). Revegetation efforts on big game winter range may require planting seedling browse plants and using seedling protectors to ensure successful establishment of shrubs.

RGC has conducted revegetation seedings on transportation access corridors and drill pits in the Drunkards Wash Unit within the Project Area each year since 1992 (Prince 1996). Seedings have been made in the fall, using seed mixes obtained from BLM and modified by UDWR. Most of the revegetation has occurred on Utah School and Institutional Trust Lands, within the salt desert vegetation type.

Revegetation results have not been systematically monitored by RGC or agency personnel. Results from the first year are reported to have been very poor, with limited establishment of seeded species and major invasion by Russian thistle and halogeton. A portion of this area was re-disturbed and revegetated in later years. Results from subsequent years, 1993 - 1995, are reported to have had much better establishment of seeded species and less invasion by undesirable species. Success was greatest in 1994, when there was a wet spring. Since 1993, RGC has used a contractor based in Price for revegetation.

3.6 WETLANDS

Available information on the distribution, abundance and types of wetlands in the Project Area is provided in Section 3.5.2, under Riparian/Wetland Communities. Information on wetlands is limited and consists of BLM mapping of riparian and wetland areas combined on BLM land, and vegetation mapping based on GAP data and aerial photography on other lands. Vegetation mapping also includes wetland and riparian together, and areas not field checked. The vegetation map is Plate 16.

Wetlands potentially under the jurisdiction of Section 404 of the Clean Water Act are mainly present in the eastern half of the Project Area, adjacent to and down gradient from agricultural areas, and are related to irrigation practices. Smaller natural wetlands may occur along portions of the Price River and other perennial streams, and at seeps and springs. Most wetlands in the Project Area would be considered palustrine emergent or scrub-shrub wetlands, under the classification system used in the National Wetlands Inventory (Cowardin 1979).

Wetlands and other waters of the U.S. such as stream beds are protected under Section 404 of the Clean Water Act, and project facilities within wetlands would require compliance with the regulatory guidelines and permitting requirements of the Clean Water Act.

3.7 WILDLIFE

3.7.1 Regional Overview

The major upland habitats present in the Project Area are discussed in Section 3.5, and include salt desert, sagebrush-grass, and pinyon-juniper. Other habitats present include riparian and wetlands areas, several perennial streams, and cliffs along the edges of benches and the Wasatch Plateau.

The BLM's Price River Resource Area is inhabited by at least 368 terrestrial wildlife species, including 249 birds, 91 mammals, and 28 reptile and amphibian species (USDI, BLM 1982). Many or most of these species can be expected to occur in the Project Area. They include game species such as elk, mule deer, antelope, moose, black bear, and mountain lion; raptor species such as bald eagle, golden eagle, Cooper's hawk, ferruginous hawk, red-tailed hawk, American kestrel, prairie falcon, great horned owl, and burrowing owl; other mammals such as red fox, porcupine, prairie dogs, and skunk; other birds such as mourning dove, rufous hummingbird, common flicker, horned lark, poor-will, tree swallow, white breasted nuthatch, hermit thrush, and mountain bluebird; and amphibian and reptile species such as leopard frog, tiger salamander, western chorus frog, boreal toad, short-horned lizard, tree lizard, garter snake, gopher snake, and great basin rattlesnake.

There are four perennial streams in the Project Area. Miller Creek and Cedar Creek are not known to have any fish. Gordon Creek has cutthroat trout in the headwaters, and mountain suckers in the lower reaches. The lower reaches have few fish because aquatic habitats have been degraded by cattle grazing. BLM has initiated efforts to restore the lower reaches of Gordon Creek for the eventual establishment of a cold water fishery. The Price River from Helper to Wellington has low numbers of fish, including mountain sucker, mottled sculpin, carp, bluegill, speckled dace, and occasional Utah chub. Catfish and chubs occur in the Price River below Wellington (Christopherson 1996), and common carp, channel catfish, bluehead sucker, red shiner, fathead minnow, sand shiner, and green sunfish have been found further downstream in the section between Woodside and the Green River, approximately 30 to 55 miles below Wellington (Masslich and Holden 1995).

Wildlife species or habitat present in the Project Area that may be affected by the Proposed Action or alternative are discussed below.

3.7.2 Big Game

Introduction

Big game habitat within the affected area is classified as critical value, high value, substantial value and limited value range. The Utah Division of Wildlife Resources defines these habitat classes as:

> Critical Habitat: Sensitive use areas that are limited in availability or provide unique qualities for high interest wildlife. These areas constitute irreplaceable, critical requirements for these species.

> High Priority or High Value: Intensive use areas that due to relatively wide distribution do not constitute critical values but which are highly important to high interest wildlife.

> Substantial Value: Areas of existence used regularly by high interest wildlife but at moderate levels with little or no concentrated use.

> Limited Value: Occasional use areas that are either sparsely populated or that show sporadic or unpredictable use by high interest wildlife.

Critical Winter Range and Security Areas. Big game critical winter range is that portion of the winter range that big game populations are concentrated on during moderate to severe winters due to excessive snow depths. These ranges are typically less abundant than high value winter ranges and summer ranges. For this reason, habitat quality and forage production on critical winter ranges dictate winter survival and thereby determine herd population carrying capacity.

For purposes of analysis in this document, an additional habitat classification was developed for big game. This classification is referred to simply as "Security Areas." These areas were identified jointly by UDWR and BLM based on past experience with big game winter distribution patterns in the affected area.

Security Areas lie entirely within designated critical winter range but are relatively small habitat areas in comparison to critical winter range. Because of unique qualities of these areas (optimum mix of quality forage and cover, proximity to natural migration corridors, and presence of topographic features which moderate severe winter conditions), they attract and support concentrated use by big game each

winter. Security Areas, though they represent relatively small areas, are considered to be, acre for acre, the most valuable winter ranges for big game.

High Value Winter Ranges. High Value winter ranges are also considered very important to wintering big game. These ranges typically lie between the critical winter ranges and summer range. Big game use high value winter ranges primarily during fall and spring migrations but also during mild winters. Because these ranges do not receive concentrated use and lie at slightly higher elevational ranges, they provide excellent forage conditions. Available quality forage is extremely important to big game during fall and spring migrations. During the fall, quality forage assures big game arrive on critical winter range in optimum physical condition prior to the onset of winter. During the spring, quality forage is important in rebuilding physical condition of big game, particularly females preparing for fawning and calving.

<u>**Mule Deer**</u>

The Rocky Mountain mule deer occurs throughout the mountains and valleys of eastern Utah. Mule deer populations throughout Utah have historically fluctuated, periodically affected by drought and severe winter weather. Populations in eastern Utah have declined in recent years but are showing signs of recovery. The recent decline is attributed to a severe five-year period of drought (1988-92) followed by a severe winter in 1992-93 which resulted in high mortality.

Three mule deer herd units are located within the Project Area. The Northeast Manti herd (Unit 30) covers the western two-thirds of the Project Area, west of Highways U.S. 6 and SR-10. Mule deer within this unit have approximately 251,000 acres of summer range (above 8,000 feet elevation) and 148,000 acres of winter range. The current harvest objective is 1,400 bucks annually, and the target winter herd size is approximately 14,000 depending on fawn production and winter survival. Range conditions are fair; doe:fawn ratios are poor; and harvest is well under the UDWR objective. In 1993 and 1994 only 469 and 391 bucks were harvested.

The San Rafael herd (Unit 37) covers the southeastern portion of the Project Area. Mule deer within this unit utilize approximately 1.6 million acres of limited value year long habitat. The current harvest objective is 100 bucks annually, with a target herd size of 1,000. In 1994, 151 bucks were harvested.

The Range Creek herd (Unit 32) covers the northeastern portion of the Project Area. This herd unit occupies approximately 320,726 acres of summer range, 462,423 acres of winter range and 14,554 acres of year long habitat. The current harvest objective is 600 bucks annually, with a target herd size of 6,000. Winter conditions in 1991 to 1993 reduced the herd significantly, and buck harvest is well below UDWR management objectives. Only 316 bucks were harvested in 1994.

Typically, wintering deer in the Project Area prefer four-wing saltbush and sagebrush vegetation for winter habitats (Fairchild and Smith 1988). The lower limit of wintering areas for mule deer often correlates with the lower end of pinyon-juniper stands (Karpowitz 1984). Critical winter ranges are occupied between November 1 and May 15 in normal years (USDI, BLM 1982). Summer habitat for mule deer consists of Gambel oak and quaking aspen at lower elevations and montane and subalpine forests at higher elevations (Garrott et al. 1987). Summer ranges occupied by mule deer from May 16 to October 31 are generally in better condition than winter ranges. Yearlong

ranges in the Project Area have much lower population levels than seasonal ranges and are generally less critical habitat areas (USDI, BLM 1982).

The distribution of mule deer habitat types in the Project Area is presented in Plate 17, and acres within each type are presented in Table 3.7-1. Critical winter range and high value winter range occupies most of the western half of the Project Area, mostly within the Northeast Manti Herd Unit. Critical summer range covers only small portions of the Project Area, on the edges of the Book Cliffs and Wasatch Plateau. Most of the eastern half of the Project Area in the Range Creek and San Rafael herd units is considered to be limited value yearlong range.

Critical winter range is that portion of the range that big game populations are concentrated on during moderate to severe winters due to excessive snow depths. During open or light winters where snow depths are not excessive, mule deer are distributed on both the critical and high value winter ranges.

Critical winter range is typically the limiting factor for mule deer herds. This is generally true because summer ranges are more productive in the amount of forage available compared to the forage production of winter ranges. Summer ranges often comprise larger land areas compared to winter ranges. This is particularly true for the Northeast Manti herd unit. In this unit, ample amounts of summer range are present while winter ranges are quite limited.

Big game security areas include 10,267 acres of mule deer critical winter habitat and 4,553 acres of high value winter range.

Elk

The Rocky Mountain elk historically occupied the entire state of Utah; the largest concentrations occurring in the Wasatch and Uintah mountains (Murie 1951). After being essentially extirpated at the turn of the century, re-introduction efforts were initiated in 1912-1915. Re-introduction was so successful that elk hunting was authorized in 1925 and by 1992 a record harvest of 10,432 elk was recorded (UDWR 1994a).

Elk within the Price Project Area are part of the Manti and Range Creek herd units. The area southeast of U.S. Highway 6 and State Highway 10 is within the geographical boundaries of a third herd unit, the Buckhorn elk herd (Unit 25), but all of the portion within the Project Area is considered to be non-habitat. The Manti elk herd (Unit 23) includes 1.3 million acres of elk range and covers part of five counties. In the Project Area it includes the area west of U.S. Highway 6 and State Highway 10. The herd is well established, and use areas are well known and documented. The management goal of Manti elk herd is to provide a yearlong bull harvest of 1,300 while providing for the harvest of a limited number of mature bulls. This requires an estimated post season herd size of 11,000 elk. In 1994, 1,050 bulls and 865 anterless were harvested. Drought conditions and poor forage production on critical winter range in Carbon and Emery counties has occurred over the last several years.

The Range Creek elk herd unit (24) covers the area northeast of U.S. Highway 6 in the Project Area. The herd unit includes portions of six Utah counties, and 163,684 acres of elk range. Management objectives are to reduce wintering elk numbers to 400 to 500 elk west of Soldier Creek Road and to increase wintering elk to

800 elk east of Solider Creek Road. Harvest in 1994 was 28 bulls (Bates 1995).

Studies in Wyoming (Murrie 1951, Anderson 1958, Ward et al. 1975), Colorado (Boyd 1970), and Montana (Knight 1970) have shown that elk winter ranges often are confined to the lower elevations along foothills, edges of valleys, and steep, rough canyons where sagebrush-grassland vegetation types predominate. Generally, elk within the Project Area winter at higher locations than deer. Wintering elk were generally found in areas with chainings and burns (Karpowitz 1984). Preferred elk summer range consists of moist sites interspersed with other necessary habitat components such as various timber types forest openings, and appropriate topography (Lyon 1975). Elk are present year-round in pinyon-juniper and mountain brush habitats at lower elevations where accumulation of snow is light.

The distribution of elk habitat in the Project Area is shown in Plate 18, and acreage summaries are presented in Table 3.7-1. Most of the western half of the Project Area is critical or high value winter range in the Manti herd unit. Substantial value winter range extends east and south to State Highway 6 and to just north of Price. The southern two-thirds of the Range Creek herd unit within the Project Area are considered to be limited value habitat. Small areas of critical summer and critical yearlong habitat occur on the northwestern and western edges of the Project Area, along the Book Cliffs and the edge of the Wasatch Plateau.

Security areas include 7,257 acres of elk critical winter habitat, and 7,553 acres of high value winter habitat.

Pronghorn Antelope

Pronghorn antelope live in open terrain, primarily grasslands and grassland-brushlands. The antelope in the Project Area are part of the Icelander Wash herd unit (No. 11) which covers 793,600 acres in Carbon and Emery Counties (UDWR 1994a). The distribution of antelope habitat in the Project Area is shown in Plate 19, and acreages of habitat are provided in Table 3.7-1. Pronghorn antelope occur mainly in the salt desert vegetation type within the Project Area. High value yearlong range occurs east of State Highway 10 and the town of Price, and potential habitat is present west of State Highway 10. Critical yearlong habitat occurs about one-half mile east of the Project Area. Antelope harvest within the Icelander Herd in 1993 was 25 bucks. There are currently about 50 antelope in the area north of Wellington, and about 150 south of Wellington (Bates 1996a). The population is expanding, and may eventually occupy the potential habitat west of Highway 10. There are right-of-way fences along both sides of the highway which restrict their movement. In the winter of 1992-93 antelope crossed the fences and highway when they were snow covered, and they may cross under other circumstances.

Moose

Moose are largely browsers, eating the stems, bark, and leaves of a multitude of trees and shrubs. Important foods include willow, fir, and quaking aspen. The distribution of moose habitat in the Project Area is shown in Plate 19, and habitat acreages are presented in Table 3.7-1. Limited value winter habitat is present in the northwestern portion of the Project Area, and along the edge of the Wasatch Plateau at the extreme western edge of the Project Area. Moose habitat within the Project Area is not within a designated UDWR herd unit, and no

specific management objective has been identified.

Black Bear

Black bears are most common in montane shrublands and forests and subalpine forests at moderate elevations, especially in areas with well-developed stands of oakbrush or berry-producing shrubs such as serviceberry and chokecherry (Fitzgerald, Meaney, and Armstrong 1994). The distribution of bear habitat in the Project Area is shown in Plate 19, and acres of habitat are presented in Table 3.7-1. High value yearlong bear habitat occurs in the northwestern portion of the Project Area and along the edge of the Wasatch Plateau in the extreme western portion of the Project Area. The most important habitats include riparian corridors along perennial streams at higher elevations.

Mountain Lion

Mountain lions are most common in rough, broken foothills and canyon country, often associated with montane forests, shrublands, and pinyon-juniper woodlands (Fitzgerald, Meaney, and Armstrong 1994). Within the Project Area, they are likely to be most common in the western half where there is more cover and broken terrain, and where there are populations of wintering mule deer.

Mountain lion are closely associated with mule deer, their principal prey, and critical habitat for mountain lion is assumed to be similar to deer critical habitat. Within the Project Area, critical habitat for mule deer would include a large portion of the area west of Highways US 6 and SR-10 (Plate 17). This area is part of the East Manti Cougar Management Unit. The average annual sport take between 1989 and 1996 from this unit is 15 mountain lion (Evans and Blackwell 1996). The area north and east of Highway 6 is part of the Range Creek Unit, and the area south and east of Highways 6 and 10 is part of the San Rafael Unit.

3.7.3 Raptors

Information on raptor nests was obtained during helicopter surveys of the Project Area and a one mile buffer zone in 1994 and 1995 (Parrish 1995). Nest histories were compiled based on these surveys and from historic information (as far back as 1980) on raptor nests obtained from BLM, UDWR, and USFWS. Nest chronologies and surveys were completed at the request of BLM, in order to comply with the Price River Resource Area Management Framework Plan (MFP). The distribution of historic and recently active nests in the Project Area are shown in Plate 20. Nests shown as historic include nests not known to be active from 1993-1995, and nests for which information from this period is unavailable.

At least eight raptor species regularly occur and nest within the Project Area: golden eagle, Cooper's hawk, red-tailed hawk, ferruginous hawk, American kestrel, prairie falcon, peregrine falcon, and great horned owl. Bald eagle occurs within the Project Area in the winter. Bald eagle, ferruginous hawk, and peregrine falcon are discussed in Section 3.8, Special Status Species, and the other raptors are discussed below.

Golden Eagle

Historically, approximately 25 nesting pairs of golden eagles have maintained territories within the Project Area, and at least 163 nests have been recorded (Parrish 1995). Three nests were active in 1994, of which one fledged young, and an additional 8 nests were tended by golden eagles in 1994 (Parrish 1995). The low occupancy and reduced nesting activity in 1994 may be a result of changes in available

prey base, a response to weather conditions, or both. Golden eagles in Utah maintain an average of 4-6 nests within a given nesting territory.

Golden eagle nests are usually located on cliffs overlooking large open expanses of grass-shrub or shrubsteppe habitat. In addition, large expanses of sagebrush are preferred in winter (Fischer et al. 1984), and tree nesting occurs in portions of the breeding range, including Utah (Palmer 1988). Within the Project Area, golden eagle nests have been recorded from numerous locations, mostly in the western half, on cliffs of canyons, benches, the Book Cliffs, and the edge of the Wasatch Plateau.

Cooper's Hawk

Cooper's hawk nest and forage in wooded habitats. Suitable nesting habitat for these species are the wooded riparian zones associated with perennial streams, especially Gordon Creek, Miller Creek, Cedar Creek, and the Price River. Two active Cooper's hawk nests were found during raptor surveys, both in riparian habitat and oakbrush near streams (Parrish 1995).

Red-tailed Hawk

This is one of the most common raptor species in North America, and uses a wide variety of habitats. Suitable nesting and wintering habitat for red-tailed hawks occurs throughout the Project Area. At least seven red-tailed hawk territories have historically occurred, and two were active in 1994 or 1995 (Parrish 1995). They are known to nest in pinyon and juniper trees in the pinyon-juniper zone, deciduous trees along riparian habitats, and on cliffs.

American Kestrel

Kestrels inhabit open terrain from sea level to approximately 13,000 feet in elevation, including plains, deserts, agricultural and old fields, meadows, and unforested portions of mountainsides where adequate prey and perching sites are available. This is an ecologically very versatile species. Old woodpecker holes or other cavities are generally preferred for nesting. One kestrel nesting territory is known to occur on a cliff within the Project Area and additional nesting territories undoubtedly occur within the Project Area (Parrish 1995).

Prairie Falcon

Typical habitat of prairie falcons consists of open, treeless terrain in generally arid habitats. Sagebrush desert and desert grasslands with nearby cliffs and rock outcrops suitable for nesting are generally preferred (Palmer 1988, Johnsgaard 1990). Eggs are typically laid along on rocky ledges in cliff habitat, or sometimes in old abandoned stick nests, such as golden eagle nests. Seven historic nest sites are known from within or near the Project Area, but none of these were known to be active during 1994 or 1995. Suitable habitat for nesting occurs in other parts of the Project Area, especially along the western boundary.

Great Horned Owl

Nesting occurs in wooded habitat, and usually occurs near water and open habitats which afford good foraging. One great horned owl nesting territory is known, from just outside the Project Area boundary, and appears to have been active in 1994. Additional great horned owl nests are probably present in the Project Area.

3.7.4 Upland Game

Sage Grouse

The sage grouse is a large upland game bird that is totally dependent on the sagebrush ecosystem for successful breeding, nesting, and winter survival. Sage grouse are not abundant in the Project Area, but historic sage grouse habitat is present. Sage grouse are known to have occurred in the western portions of the Project Area, but have not been observed in recent years (Mills 1996). Lower bench areas such as Porphyry Bench are known to have supported wintering sage grouse, and upper benches such as Horse and Telephone Benches have also been used by sage grouse in past years. Sign typical of that associated with leks has also been found, and sage grouse have been observed strutting on Telephone Bench. The lack of recent sign in the Project Area may be related to regional population cycles and/or trends, with regional populations currently being low.

Helicopter surveys for strutting grounds were conducted in the spring of 1995 for this EIS, and no signs of sage grouse or sage grouse strutting grounds were observed (MDG and Associates 1995a). However, no on-ground survey work was completed.

3.7.5 Other Mammals

White-tailed Prairie Dogs

Numerous species are affiliated with prairie dog colonies and are dependent on them for food, cover and breeding habitat. Several of the species dependent on prairie dogs are threatened, endangered or sensitive species, including black-footed ferret, ferruginous hawk, and burrowing owl. Because prairie dogs are pivotal in the functioning of ecosystems, they are sometimes considered a key-stone or critical link species. Keystone species significantly influence the distribution, abundance, and/or diversity of other species (Finch 1992).

Four areas of white-tailed prairie dog activity are known to occur in the Project Area, totaling 31 colonies occupying 6,865 acres. Individual colonies are generally continuous in available habitat and are usually separated from each other by topography or landscape features such as long sandstone ridges and broad washes (MDG and Associates 1995b). Distribution maps are provided in a separate report (MDG and Associates 1995b).

3.8 SPECIAL STATUS SPECIES

3.8.1 Regional Overview

Threatened, endangered, and sensitive species are plants and animals that are protected under the Endangered Species Act (50 CFR 17) of 1973, as amended, or other state or federal agency regulations. In general, the protection afforded imperiled species under the ESA includes prohibition from harming or trafficking in endangered species; and, under Section 7 of the Endangered Species Act, the federal government is forbidden to take any action that is likely to jeopardize an endangered or threatened species or to degrade its critical habitat.

Under the Endangered Species Act, an endangered species is one in danger of extinction throughout all or a significant portion of its range: a threatened species is one likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Candidate species (C1) are those being considered for listing as threatened or endangered. Until recently, the U.S. Fish and Wildlife Service (USFWS) also maintained a list of category 2

(C2) species, those for which listing was considered possibly appropriate, but for which more information on biological vulnerability and threat were needed to support proposed rules. As of February 28, 1996, the USFWS no longer maintains a list of C2 species, but they are considered to be sensitive by BLM personnel and other agencies.

Utah Division of Wildlife Resources draft status categories (UDWR 1995) include endangered, threatened, S1 (species declining in population, distribution and/or habitat), S2 (species occurring in limited areas and/or numbers due to a restricted or specialized habitat), and S1S2 (both declining and of limited occurrence).

Under Section 7 of the Endangered Species Act, federal agencies are required to evaluate the effects of their actions on listed and proposed endangered and threatened species, and to consult with the USFWS if they determine that their actions may affect any species. This EIS, and specifically sections 2.0, 3.8.3 and 4.8, has been developed to serve as the BLM's Biological Assessment for the Price CBM Project, and a separate stand-alone Biological Assessment will not be prepared.

Species of concern and their status, that may be present within the Project Area, are listed in Table 3.8-1. Copies of correspondence with the USFWS are provided in Appendix 3C.

3.8.2 Federal Endangered or Threatened Species

Bald Eagle

The bald eagle is a federally listed threatened species that is known to winter in the Project Area. It is an opportunistic forager during winter, often relying on rabbits, ground squirrels and carrion and typically roosts communally during winter. Twenty-five to 30 bald eagles typically utilize the Project Area during the winter (Bates 1994). The USFWS considers winter roosts used by 15 or more bald eagle for over two weeks as critical habitat.

Field surveys for bald eagle roosts were conducted four times by fixed-wing plane and helicopter in February and March 1995 (MDG and Associates 1995c). The initial survey covered the entire Project Area, and subsequent surveys flew drainageways, areas of known eagle use and other areas of potential habitat. An estimated 8 to 12 wintering bald eagles were present in the Project Area during the survey periods, and four winter roost sites were observed. None of the roosts met the USFWS significance criteria of use by 15 or more bald eagles. However, the winter of 1994-95 was generally mild, and the abundance of bald eagles was reduced from typical winters (Bates 1994). Based on past records, one of the sites typically has 12-15 bald eagles, and a second site typically has 5-10 bald eagles (Bates 1994).

Black-Footed Ferret

Black-footed ferrets depend on prairie dog colonies as a source of food and shelter. Changes in land use practices and poisoning programs over the last century have substantially reduced prairie dog distribution in the western United States. As a result, all active prairie dog towns, or a complex of towns, large enough to support ferrets are considered potential black-footed ferret habitat. Current USFWS criteria for defining potential black-footed ferret habitat consists of any black-tailed prairie dog town or complex of greater than 80 acres in area and any white-tailed prairie dog colony or complex greater than 200 acres in size (USFWS 1989). The Project Area contains 31 white-tailed prairie dog colonies totaling approximately 6,865 acres (MDG and Associates 1995b). These towns are all within 7

kilometers of each other, thereby meeting the criteria as a contiguous complex.

Black-footed ferret are not known to currently occur in the Project Area, although there have been unconfirmed reports of past sightings. The Utah Natural Heritage Program has records of four historic observations of ferrets within the Project Area. One was found north of Price in 1966 but may have been a domestic ferret; three were reported between Price and Huntington off of Highway 10 in 1984; and two northwest of Wellington in 1984 (Peterson 1995). Surveys were conducted in the winter and summer of 1995 following standard USFWS survey methods and no signs of black-footed ferret were observed (MDG and Associates 1995b).

Colorado River Fish

Four endangered fish species occur in the Colorado River downstream from the Project Area: humpback chub, razorback sucker, Colorado squawfish, and bonytail chub. These fish inhabit large rivers, pools, eddies, and other areas adjacent to the main current flows, and move into main channel areas to feed (Haynes and Muth 1982, Woodling 1985). There are no current or historic records of their occurrence in the Project Area. The closest documented occurrence is one juvenile Colorado squawfish in the Price River at river mile 2.2 from the confluence of the Green River, approximately 50 miles downstream from the eastern edge of the Project Area.

Peregrine Falcon

The peregrine falcon is listed as endangered by both the USFWS and the State of Utah. They nest on cliffs, typically associated with riparian habitat, throughout Utah. The Colorado Plateau portion of the population in Utah is currently recovering.

An active peregrine falcon eyrie (nest) was discovered in the summer of 1996 on the western edge of the Project Area, during raptor nest surveys conducted by UDWR and a coal mine operator. Peregrine falcon had not previously been observed breeding in the Project Area (Avocet 1995), although they were known to nest elsewhere in both Carbon and Emery County. Individuals may also occur in the Project Area during migration.

Endangered and Threatened Plants

Six plant species in Emery County are listed as endangered or threatened, including Barneby reed mustard, Jones cycladenia, Last Chance Townsendia, Maguire Daisy, San Rafael cactus, and Wright fishhook cactus. These are species of central or southwestern Emery County (Atwood et al. 1991), and are not known or expected to occur in the northwestern portion of the county where the proposed project is located.

3.8.3 Sensitive Species

Northern Goshawk

The northern goshawk is the largest North American member of the genus *Accipiter* and inhabits coniferous, deciduous, or mixed forests. This species requires large coniferous or deciduous trees in older stands for nesting. Nesting stands typically have a high degree of canopy closure and are often located on northern aspects (Reynolds 1989). Suitable nesting habitat is critical to the reproductive biology of goshawks. Nest areas are frequently reused for years and many goshawks have between two and four alternate nest areas within their home range (Reynolds et al. 1992).

Surveys for northern goshawk were conducted for the EIS in the winter and spring of 1995 (MDG and Associates 1995c). Aerial surveys of suitable habitat were conducted simultaneously with bald eagle aerial surveys, and all stick nests observed were mapped. Based on these surveys, there are no riparian or forest stands within the Project Area satisfying the nesting habitat requirements of the northern goshawk, which according to Reynolds et al. (1992) consist of older aged forest stands that have a high density of large trees, high tree canopy cover, and high basal area. Some marginal habitat with stick nests was identified in the upper reaches of Gordon Creek, but ground verification of stick nests in this area during the breeding season resulted in no observations of northern goshawk. Other riparian corridors associated with perennial streams with mature or overmature cottonwood also represent potential, although marginal, habitat for this species.

Ferruginous Hawk

This is the largest hawk in North America. It inhabits open prairie and desert habitats and is strongly associated with primary prey species such as ground squirrels and jack-rabbits. Nests are often placed on the edge between pinyon-juniper and shrub steppe, where there are trees for nesting adjacent to open foraging areas. There are at least four areas of historic nesting within the Project Area, none of which were active in 1994 or 1995 (Parrish 1995). An additional ferruginous hawk nest is located outside the Project Area near Wellington, and produced two young in 1994.

Western Burrowing Owl

The western burrowing owl breeds in prairie, desert, sagebrush, and pinyon-juniper habitats in western North America (Finch 1992). Burrowing owls use the burrows of digging mammals for nesting burrows which they fill with organic debris and animal dung for nesting material (Evans 1982). This species is likely to occur in the Project Area during the spring and summer. They are likely to be uncommon in much of the Project Area, but common in prairie dog towns. They were not observed during summer searches of the 6,685 acres of white-tailed prairie dog towns in the Project Area, but the surveys were done in September, after the time that burrowing owls were likely to have migrated.

Loggerhead Shrike

The loggerhead shrike is a perching bird of pasture, savannah and open brushland and is territorial in winter as well as summer (Fraser and Luukkonen 1986). Based on a literature review, discussions with local experts, and evaluation of available habitat, only about 17,643 acres of potential nesting habitat for loggerhead shrike occur within the Project Area (MDG and Associates 1995d). Breeding areas typically include open habitats with sparse trees and shrubs; elevated hunting perches; nest sites in large sagebrush, greasewood, pinyon-juniper or the interior of abandoned black-billed magpie nests; foraging areas within open, shortgrass habitats within a short distance of an elevated perch; and elevation below 6,000 feet. Shrike are typically observed in south-central Utah in pinyon-juniper and sagebrush habitats, and the arid salt desert vegetation of the Castle Valley may not provide enough prey base to support breeding shrike.

Potential breeding habitat covers only about 10 percent of the Project Area, and occurs primarily in the northern and central portions where there are edges between pinyon-juniper and sagebrush-grassland vegetation, at 6,000 feet elevation or less. Few shrike have been recorded during breeding bird surveys and observations have been limited to the extreme

eastern and southern portions of the Project Area. Small numbers of juvenile and adult shrike were observed during field studies conducted during 1994.

Spotted Bat

The spotted bat is a federally listed candidate species that occurs primarily in the Southwest and extends north into Montana (Watkins 1977). The apparent rarity of spotted bats may be a function of their non-colonial behavior (Toone 1993). Habitats used by spotted bat consist of arid rough desert, ponderosa pine and limestone cliffs. This species is apparently widespread although extremely rare. A recent study of spotted bats was conducted by the Utah Division of Natural Resources in an area that included western Carbon and Emery Counties. The closest occurrences identified in this survey were at Johnson Valley Reservoir dam, the Fish Creek Mine site, and at Snow lake (Toone 1993), and no occurrence was found within or near the Project Area. Another recent study (Toone 1995) involved field surveys at a number of sites in the BLM Price River Resource Area, including sites representing a variety of habitats within the Book Cliffs/Roan Cliffs Plateau and Wasatch Plateau regions. Spotted bats were observed at several sites. Although they were not specifically found in the Project Area, they were found in similar habitats and can be considered likely to occur. Spotted bats roost in crevices in limestone and sandstone cliffs, and forage preferentially over water, wetlands, riparian areas and irrigated meadows within approximately 6 miles of day roosts.

Other Bats

Six species of sensitive bats are known or likely to occur within the Price River Resource Area (Toone 1995). These include big free-tailed bat, fringed myotis, long-eared myotis, long-legged myotis, and small-footed myotis, and Yuma myotis (Toone 1995) Pale Townsend's big eared bat may potentially occur.

Colorado River Fish

Two sensitive Colorado river fish, the roundtail chub and flannelmouth sucker occupy slow moving waters adjacent to areas of faster river waters or pools of streams and large rivers. Young-of-the-year prefer shallow river runs while juveniles concentrate in river eddies and irrigation ditches (Valdez 1982; Wiltzius 1978). Neither of these species are known or expected to occur within the Project Area, but they occur downstream in the lower Price River and in the Green River. A recent study in the Price River between Woodside and the confluence with the Green River (approximately 30-55 miles downstream from the Project Area) captured 76 flannelmouth and no roundtail chub (Masslich and Holden 1995).

Creutzfeldt Catseye (cryptantha)

This herbaceous plant species is very limited geographically, from Fremont Junction to East Carbon, in Emery and Carbon counties, Utah. It grows primarily on the Blue Gate member of the Mancos Shale, often where there is a veneer of sandstone fragments, in openings within pinyon-juniper habitat. There are two known occurrences just west of Price, Utah (Intermountain Ecosystems 1995, Peterson 1995). A survey conducted in August of 1994 found no additional occurrences of this species within the Project Area (Intermountain Ecosystems 1995). However, much of the Project Area is potential habitat.

Canyon Sweetvetch

This plant species inhabits shaded intermittent washes and perennial streams in sagebrush, pinyon-juniper, and mountain shrub communities (Intermountain Ecosystems 1995). Several occurrences have been documented near the Project Area in the Book Cliffs and the Wasatch Plateau, including one occurrence near Hiawatha (Intermountain Ecosystems 1995, Peterson 1995). Surveys conducted for this EIS found no occurrences of this species within the Project Area (Intermountain Ecosystems 1995), but it may occur in shaded riparian areas and ephemeral or intermittent washes.

Graham Beardtongue

This federal candidate species is known or expected to occur in Carbon County (USFWS 1996). It is a species of the Uintah Basin in Utah and Colorado (Atwood et al. 1991), which covers part of eastern Carbon County. It is not known or expected to be present in western Carbon County or the Project Area.

3.9 CULTURAL RESOURCES

Cultural resources are defined as fragile and nonrenewable remains of prehistoric and historic human activity, occupation, or endeavor as reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features that were of importance in human history. Cultural resources comprise the physical remains themselves, the areas where significant human events occurred even if evidence of the event no longer remains, and the environment surrounding the actual resource. BLM-Utah defines a cultural resource site as a discrete locus of human activity that is presumed to be interpretable.

Significant cultural resources are defined as those listed on or eligible for listing on the National Register of Historic Places (NRHP). Significant cultural resources must be at least 50 years old and meet one or more of the criteria presented in 36 CFR 60.4, which specifies that the quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects of State and local importance that possess integrity of location, design, setting, materials, workmanship, feeling and association, and (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or (b) that are associated with the lives of persons significant in our past; or (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or (d) that have yielded, or may be likely to yield, information important in prehistory or history.

Prehistoric cultural resources are generally evaluated with respect to criterion (d), which pertains to a site's potential for yielding scientifically valuable information. The measure of the importance of the scientific data is based upon research questions widely recognized as appropriate by the scientific community. Sites most likely to yield these important data are those with intact cultural deposits, where artifacts and features are relatively undisturbed. In addition to retaining contextual integrity, sites with the highest research value are those likely to contain cultural features. Features such as hearths, storage or habitation structures, or living surfaces often yield charcoal for radiocarbon dating, macrobotanical, palynological, and faunal evidence of subsistence practices, and

associated datable artifact assemblages. Sites with artifacts diagnostic of a particular temporal period or cultural group are also regarded as having higher research potential than those lacking diagnostic artifacts. Sites attributable to a specific cultural unit can be used to address specific research questions and are regarded as important resources.

Historic sites can potentially meet any of the four criteria for eligibility to the NRHP. Frequently, however, the focus is upon architectural significance or association with events or individuals of historical importance. Although site-specific historical research is often warranted after a site is identified to determine whether it was associated with an important individual or event, a site's value as an archaeological resource should not be overlooked. When considering a historic site's archaeological value, the condition of structures or burial of cultural deposits are not as important as whether information exists on the site in the form of artifacts or cultural features that can answer questions of particular interest about the past. Sites that can be confidently ascribed to a particular historic theme and subtheme are generally regarded as having more research value than sites that cannot be ascribed to a theme. Significant historic archaeological resources are those that are relatively undisturbed, can be attributed to a specific theme, and retain sufficient artifacts and features to permit further study. Linear cultural resources such as roads, trails, and ditches generally possess little archaeological value, though in some instances they may retain engineering significance or be associated with important historic events. Roads, trails, and railroad grades, however, may have other historic site types associated with them that are important archaeological resources, the proper interpretation of which may depend upon identification of the linear site.

The significance of traditional cultural properties is usually assessed by talking with tribal elders and other knowledgeable individuals and through historical documentation. Some traditional cultural properties may be significant to an entire Native American group, whereas others may be significant to an individual or family.

3.9.1 Regional Overview

The human occupation of central Utah began roughly 12,000 years ago. Archaeological evidence exists of use of the area by Paleoindian (10,000-7500 B.C.), Archaic (7500 B.C. - A.D. 150), Fremont (A.D. 500-1200), Protohistoric Numic (A.D. 1200-1700), and historic Ute (A.D. 1700 to 1880). The first documented Euroamerican foray into the region was the Dominguez-Escalante Expedition of 1776. The area was exploited by fur trappers in the early nineteenth century, with government and Mormon expeditions entering the area in the 1850s. Settlements related to agriculture, ranching, and mining began to be established in the 1860s and increased following the construction of the Denver & Rio Grande Railroad in 1882. Coal mining boomed in the region until the 1920s and remains a major industry in the area today.

3.9.2 Model for Cultural Resources

In order to assess anticipated impacts to significant cultural resources in the Project Area, a Class I inventory (site file search) was conducted at the Antiquities Section, Division of State History, Salt Lake City, and at the BLM, Price River Resource Area Office, Price, Utah. Locations of previously recorded sites were plotted on project maps, and the following site data were compiled: site type, cultural affiliation, and NRHP status. The NRHP for Carbon and Emery counties was

checked to identify cultural properties listed to date. The General Land Office Historic Index, on file at the BLM Utah State Office, Salt Lake City, was reviewed to identify the time range and density of homestead entries in the Project Area.

Numerous sample-oriented (i.e., "Class II") and intensive (i.e., "Class III") cultural resource inventories have been conducted within or adjacent to the boundaries of the Project Area (e.g., Harper et al. 1978; McDonald 1978; Hauck 1979; Reed and Chandler 1984; Black and Metcalf 1986; Billat 1982; Berge and Spencer 1977; Montgomery 1984; Norman and Hauck 1980; Norman et al. 1980; Robinson 1981). Most of the inventories have been for linear projects such as roads, seismic lines, and pipelines, but some block inventories have also been conducted. Cultural resource inventories have been conducted in advance of development of the non-agricultural land managed by the BLM. The Price River corridor, much of which is privately owned land, has received the least intensive inventory coverage. Cultural resource inventory coverage is also poor in the Poison Spring Bench area; north of Miller Creek, particularly in the Pinnacle Bench, Porphyry Bench, and The Cove areas; and in the Upper Gordon Creek area.

Taken as a whole, the cultural resource surveys have provided data on where sites are located, and perhaps just as importantly, have identified locales where sites are not located. USGS topographic maps, vegetation maps, and soils maps, in concert with the historic site data, were employed to identify areas of high, medium, and low sensitivity for cultural resources (Plate 21).

Known prehistoric sites are restricted to the slightly higher upland areas of the Project Area, above 6,000 feet in elevation, suggesting that the lower areas were seldom used by prehistoric peoples. It is likely that the slightly higher uplands, which are characterized by piñon-juniper woodland vegetation, had more to offer in terms of diversity of plants and animals, and that limited agriculture may have been practiced there in suitable situations during Formative times. Fremont habitation sites are most abundant on low rises next to stream courses or springs where arable soils are present and water is available. Prehistoric activity areas or resource procurement locales are found on level terrain at slightly higher elevations in piñon-juniper woodlands. Again, a settlement pattern along permanent water is noted.

Although the cultural resource inventory data would appear to suggest that historic sites are distributed broadly and sparsely throughout the entire Project Area, the distribution of recorded historic archaeological sites does not appear to be an accurate reflection of historic activity in the Project Area. The General Land Office Historical Index, on file at the Utah State Office of the BLM, suggests a much more patterned distribution of historic sites. Data on the distribution of homestead entries were used in conjunction with known historic site data to define sensitivity zones for historic sites.

The high sensitivity areas total 86,483 acres, or roughly 46 percent of the Project Area. Of this total, 24,496 acres are BLM, 10,200 acres are UDWR, 10,497 acres are State, and 41,290 acres are privately owned. Areas of high sensitivity for cultural resources include the following:

- In areas above 6,000 feet elevation, a one-mile-wide corridor along permanent streams (i.e., the original location of Cedar Creek, Miller Creek, the North and South Forks of

Gordon Creek, Trail Creek, Bob Wright Creek, and Mud Water Creek and its permanent tributaries). Expected significant site types in this zone include prehistoric habitation sites, rock art sites, and campsites.

- A 660-foot radius buffer zone around springs. Expected significant site types in this zone include prehistoric habitation sites, rock art sites, and campsites.

- Areas associated with historic coal mining (i.e., the upper Gordon Creek drainage, the upper Miller Creek drainage in the vicinity of Hiawatha, the Wattis Siding area). Expected significant site types in this zone include both occupied and abandoned townsites, railroads and railroad facilities, and active and abandoned coal mines.

- Areas of intensive agricultural settlement in historic times (i.e., the irrigable lands along the Price River, the Gordon Creek valley, and the Elmo and Desert Lake vicinity in the southeastern portion of the Project Area). Expected significant site types include towns, active and abandoned farms and ranches, and ancillary facilities.

The medium sensitivity areas total 82,052 acres, or roughly 44 percent of the Project Area. Of this total, 49,834 acres are BLM, 901 acres are UDWR, 15,332 acres are State, and 15,984 acres are privately owned. Areas of medium sensitivity for cultural resources include the following:

- The uplands in the western portion of the Project Area. The level terrain above 6,000 feet elevation is characterized by piñon-juniper woodlands. Expected significant site types include prehistoric campsites and, occasionally, prehistoric habitation sites.

- Marginal agricultural lands that are expected to contain abandoned farms and ranches that were occupied for short periods in the 1910s and 1920s, occasional long-term or currently occupied farms and ranches, and camps related to sheep and cattle grazing.

- Areas where low-production coal mining took place. Expected site types include sections of coal mining railroad grades, minor railroad facilities, and small coal mines and associated facilities.

The low sensitivity areas total 19,708 acres, or roughly 11 percent of the Project Area. Of this total, 8,055 acres are BLM, 9,037 acres are State, and 2,346 acres are privately owned. No UDWR land is in the low sensitivity areas. Low sensitivity areas are the salt desert lands along State Road 10 in the center of the Project Area and steep slopes at the southwest and northwest corners of the Project Area. No prehistoric cultural resources are expected within the low density zone. Historic site types expected in the low sensitivity zone include small campsites or artifact scatters and occasional evidence of briefly occupied farms and ranches. Few, if any, sites in the low sensitivity zone are expected to be recommended as NRHP eligible.

3.9.3 Known Cultural Resources

To date, five cultural resource inventory projects have been conducted for the RGC drilling program in the Drunkard's Wash section of the Project Area. One compressor station site, 79 well locations, and associated access roads and pipelines were intensively examined for cultural resources, for a total of 580 acres inventoried at the Class III level. A historic railroad grade, a historic livestock herding camp, and 20 isolated historic and prehistoric artifacts were recorded. Because none of the cultural resources were considered significant, it was determined that the initial drilling program would have no effect on the region's cultural resource database (Nielson 1993a, 1993b, 1993c; Nielson and Sulz 1993, 1994). The Drunkard's Wash section is located entirely within the low sensitivity zone as defined in Section 3.9.2 above.

A total of 70 prehistoric sites, comprising 71 prehistoric site components, has been recorded in the entire Project Area to date. A large number of these (29 sites, or 41 percent) are lithic (stone tool) scatters for which cultural affiliation could not be determined. No sites with Paleoindian components have been recorded to date in the Project Area, but six sites with Paleoindian projectile points have been recorded at the southern end of Castle Valley (Black and Metcalf 1986). Although Archaic sites are common in central Utah, only one lithic scatter with a diagnostic Archaic projectile point has been recorded in the Project Area.

Sites affiliated with the Fremont culture are common in the Project Area, numbering 25 (35 percent). Site types include rock art panels (6), artifact scatters (6), habitation sites containing masonry rooms (12), and a campsite (1). A Fremont village and numerous rock art panels have been recorded along Gordon Creek. Three Fremont village sites have been excavated near the southwestern boundary of the Project Area (Madsen 1975).

Late Prehistoric sites that can probably be attributed to the Numic/Ute are not numerous in the Project Area. These consist of one rock art site and two campsites. The rock art site was recorded as a dual component Fremont/Late Prehistoric site.

No prehistoric sites in the Project Area have been formally listed on the NRHP, but 28 prehistoric sites (40 percent of all recorded prehistoric sites) have been recommended by field recorders as eligible for listing on the NRHP.

Another category of cultural resources that must be considered are traditional cultural properties that have been identified by contemporary Native American groups as having religious or other traditional significance. To date, no traditional cultural properties have been identified in the Project Area. Although the Project Area is not in a claim determined by the Indian Claims Commission, Numic-speaking groups and Puebloan groups have a historic interest in the area.

Eighty-five historic archaeological sites have been recorded in the Project Area; numerous other historic sites are known to exist but have not yet been formally recorded. Recorded sites include the coal mining townsite of Mohrland, 5 residential sites, 10 other sites that contain historic structural remains, 5 sites associated with coal mining, 4 sites related to railroads, 5 historic camps, 14 artifact scatters, 1 bridge, and 2 canals or canal complexes. Sixteen historic archaeological sites (35 percent of all recorded historic sites) have

been recommended by field recorders as eligible for listing on the NRHP. In addition, 10 buildings in the town of Price have been listed on the NRHP: The Oliver John Harmon House, the Greek Orthodox Church of Assumption, the James W. Loofbourow House, the Parker & Weeter Block/Mahleres-Siampenos Building, the Moyneir House, Notre Dame de Lourdes Catholic Church, Price Municipal Building, Price Tavern/Braffet Block, Star/Carbon Theater, and the Price Main Post Office. In Spring Glen, the Martin Millarich Hall and Topolovec Farmstead are listed properties.

3.10 LAND USE

3.10.1 Regional Overview

The Project Area lies within southern Carbon County and northern Emery County, Utah. Public lands within the Project Area are administered by the USDI, BLM, the UDWR, and SITLA. Land ownership and jurisdictional boundaries are shown on Plate 1. Private lands are under the jurisdictions of Carbon and Emery counties and the incorporated cities of Price and Wellington.

3.10.2 Land Jurisdictions

Existing land uses within the Project Area consist of rural communities, mineral exploration and production facilities, transportation and utility corridors, agriculture, grazing, wildlife habitat and dispersed recreation. Plate 22 shows this distribution of land uses in the Project Area. Wildlife habitats, grazing, and recreation are discussed in Sections 3.7, 3.11 and 3.12, respectively.

The distribution of federal, state and private lands forms a mosaic pattern over the Project Area. The BLM lands are administered by the Moab District and Price Resource Area. BLM lands are concentrated in large blocks in the northeastern and western extent of the Project Area. The U.S. Department of Agriculture, Forest Service manages the Manti-LaSal National Forest, located west of the Project Area. State lands managed by SITLA are similarly dispersed throughout the Project Area, with larger blocks located to the northeast and southwest of Price. Lands under the jurisdiction of the State of Utah, Division of Wildlife are part of the Gordon Creek State Wildlife Management Area (Plate 22).

3.10.3 Existing Land Uses

The communities in Carbon and Emery counties have historically developed in response to mineral and energy developments. Most of the towns within the Project Area are primarily situated along Highway 6 and include Spring Glen, Carbonville, Price, and Wellington. Among these, the City of Price is the largest community and is the county seat of Carbon County. Located approximately 9 miles west of Highway 6 on State Route 122 is Hiawatha, a historical mining town which is now largely abandoned. There are no Emery County communities within the Project Area, although Elmo is adjacent and east of the Project Area.

A variety of mineral and extractive uses are within or near the Project Area. Major facilities and operations are Co-op Coal Mining and Andalex Resources. A number of extractive-related industries occur as well, including coal transportation services, rock products, sand and gravel operations, and abandoned coal mines. Other large-scale mineral/energy developments within the region are the Castlegate Mines No. 1 and 2 and the Castlegate Project Area. These operations are all located north of the Project Area in Carbon County. In Emery County, the Hunters Plant and Huntington Plant and mine lie to the south of the Project Area.

The existing CBM operations are located in the central part of the Project Area, and consist of 98 wells, located on private and state lands. Ancillary facilities associated with the existing RGC operations consist of a network of roads and pipelines, a compressor facility, an injection well, and power distribution lines.

Agricultural lands within the Project Area consist of both irrigated cropland and grazing lands. Irrigated crops are found primarily in the eastern part of the Project Area, along the Price River Valley. Principal crops include grains, hay, silage, vegetables and melons. Grazing is a primary use on much of the public lands, which are principally used for domestic livestock summer pasture. Livestock and poultry products are cattle/calves, dairy products, hogs and pigs.

3.10.4 Land Use Plans

The management of federal public lands and resources within the Project Area is directed and guided by the BLM's Price River Resource Area Management Framework Plan for the years 1983-84 (USDI, BLM 1984a) and the San Rafael Resource Management Plan (1988c). Other management direction is provided in the Price River Resource Area MFP Supplement on the Designation of Hydrocarbon Lease Categories Outside Special Tar Sands Areas (USDI, BLM 1984a), and the subsequent Environmental Assessment Supplement on Cumulative Impacts on Oil and Gas Categories (USDI, BLM 1988a). The US Forest Service manages lands on the Manti-LaSal National Forest in accordance with the Land and Resource Management Plan, Manti-LaSal National Forest (USDA, FS 1985). National Forest lands are west of the Project Area.

The Federal Onshore Oil and Gas Leasing Reform Act of 1987 (Public Law No. 100-203) requires that the BLM regulate all surface disturbing activities on surface or mineral estate owned by the United States of America and managed under the jurisdiction of the BLM (30 U.S.C. 226(g)). The BLM is responsible for ensuring that development activities are conducted in a manner that minimizes conflicts with other uses and damage to surface resources. This review is accomplished through the APD process. An APD includes a drilling plan, evidence of bond coverage, and other information deemed appropriate by the BLM for evaluating the proposed well.

The management of State of Utah lands primarily is the responsibility of the SITLA. The state does not have a general management plan for lands in the Project Area. The SITLA makes decisions regarding the use of state lands directed toward obtaining the greatest possible monetary return for the trust consistent with sound management practices; managing trust lands for their highest and best use; and perpetuating the renewable natural resources on trust lands using conservation practices. For wells drilled on Utah mineral estate, applicant(s) would seek approval from the UDOGM, and approval from the SITLA for access onto state-owned surface lands. To develop on private mineral estate, applicant(s) would submit an APD to the UDOGM, and enter into agreements with the individual landowners for access to the sites. The Project Area includes "split-estate" lands (i.e., surface ownership and mineral estate ownership are split between two different owners or land managing agencies.) Other state lands in the Project Area are part of the Gordon Creek Wildlife Management Area. The Land Management Plan for the Gordon Creek Wildlife Management Area sets directive for this reserve. The overall purpose of the plan is to manage for the benefit of high interest species (in particular, mule deer and elk) that

are associated with ecosystems existing within the 22,960 acres of the management area. More information on this area is provided in Section 3.10.5.

Land management decisions on private land in Carbon and Emery Counties are guided by adopted county land use plans, a development code, and zoning ordinances and regulations. Carbon County adopted its County Master Plan and Zoning Regulations in July, 1972. Emery County's Master Plan and Zoning Regulations were adopted October 1970. Both counties are in the process of updating their master plans. Carbon County has the Preliminary Draft Carbon County Comprehensive Plan, prepared by Bear West Consultants, Salt Lake City, which was released in late 1995. Revisions are currently being made. It is anticipated that the County Commissioners will make decisions regarding the adoption of a new master plan by the autumn of 1996. It should be noted that, as an appendix to the new Carbon County Comprehensive Plan, a Carbon County Trails Plan has been completed and adopted. This plan identifies recreational resources, current outdoor recreation activities and perceived issues and needs of the County. A number of the trails identified in the plan are within the Project Area including the Kenilworth/Price Loop, Consumers Wash Road, and Pinnacle Bench/Creek Roads. Recreational opportunities are discussed in Section 3.12.

Regarding County zoning, classifications that apply to Carbon County lands within the Project Area include:

- Residential Agricultural (RA-20)
- Rural Residential (RR-1, RR-2.5, and RR-5)
- Residential (R-1-20K, R-1-8K, R-2-8K and R-4-8K)
- Light Industrial (I-1)
- Mining and Grazing (M&G1)
- Mobile Home Residential (MR-1-20K)
- Retail Commercial (C-1)
- Wholesale Commercial (C-2)
- General Industrial (I-2)
- Critical Environmental (CE-1 and CE-2)

Within Emery County, zoning for the Project Area includes:

- Agriculture (A-1)
- Mining and Grazing (M&G1)
- Industrial (I-1)

The majority of the Project Area is within Carbon and Energy counties M&G1 zone. Gas production wells are considered a permitted nonconditional use within the M&G1 zone and all other Carbon County zones except CE-1 or CE-2, “Critical Environmental.” Gas production wells are allowed in all zones of Emery County, following approval by the County Commissioners. Local zoning ordinances of Price and Wellington would also apply to lands within these incorporated towns.

At the local level, no special use permit would be required in Carbon County since the project would not affect lands above 7,000 feet amsl, where the CE-1 or CE-2 Critical Environmental Zones would apply. Within Emery County, no special use permit is required; however, approval by the County Commissioners would be required prior to the initiation of project construction activities.

3.10.5 Gordon Wildlife Management Area

This area is located in and adjacent to the northwest portion of the Project Area (Plate 22, Land Use). It encompasses 22,960 acres, of which 21,000 are controlled (surface ownership or lease) by Utah Division of Wildlife Resources and BLM, and 1690 acres are in private ownership (UDWR 1993,

1994b). About half of the area is either federal surface (6,900 acres) or split estate with federal mineral ownership (5,800 acres). About 1/3 of the land owned by or leased by UDWR has federal mineral ownership.

The Gordon Creek Wildlife Management Area provides wintering habitat for over 2,000 elk and thousands of mule deer. Elk that use Gordon Creek come from the Scofield, Beaver Creek, Huntington Canyon, and Gentry Mountain areas, and as far away as Indianola and Fairview. Land purchases by UDWR began in 1960 and continued until 1982. UDWR has also purchased water rights on the North Fork of Gordon Creek, Bob Wright Creek, and other streams.

Most of Gordōn Creek Wildlife Management Area is rangeland, but there are three historic cultivated fields on UDWR lands, totaling nearly 600 acres. Irrigation and ditch maintenance has been sporadic since 1980, and forage productivity and quality has greatly decreased. Habitat improvements have included a 2,000 acre chained/reseeded area, spring cattle grazing to reduce competition to browse from grasses on the eastern benches, placement of road-killed deer for bald eagles, reclamation of roads and trails, installation of water catchment and troughs on BLM land to encourage wider dispersal of animals, and reseeding of portions of the historic cultivated fields.

UDWR management goals are to manage habitats for optimum numbers and diversity of wildlife species, with special emphasis on deer, elk and moose, and to allow regulated public access for consumptive and nonconsumptive uses that do not unduly impact habitat or wildlife during crucial periods. BLM lands within the Gordon Creek Wildlife Management Area are also managed for wildlife in coordination with UDWR, and all forage rights on federal lands within the area have been assigned to wildlife since 1965.

3.10.6 Planned Developments

In addition to the Castlegate CBM Project and the Helper CBM Project, proposed developments within the Project Area include the Hiawatha Co-generation Plant, located near the Carbon/Emery county border near Hiawatha; and the Covol Project, near Wellington. The Hiawatha Co-generation Plant would generate 105MW of power. The Covol Project would utilize waste coal on land purchased from Nevada Power near Wellington to produce coal briquettes. Other smaller proposed developments include seven approved subdivisions in and around Price, and a sawmill near Wellington. No proposed projects were identified for Emery County.

3.10.7 Transportation

All roads that serve the proposed CBM development area and the communities of Price, Wellington, Helper, Huntington, and Castle Dale were considered in this EIS. This transportation network would be used by project workers commuting to the CBM development area from those communities, as well as by trucks hauling various equipment and supplies to the development area. Plate 22 provides a map of roads serving the Project Area.

Major Highways. Federal and state highways provide the main transportation access to the Project Area. The major transportation network in the Project Area consists of three highways: U.S. Highway 6, State Route 10, and U.S. Highway 122. Descriptions of each highway are presented below. These highways are maintained by the Utah Department of Transportation. Historic and current traffic

counts for each of these highways are provided in Table 3.10-1.

U.S. Highway 6 is an important north-south highway that connects the Project Area with Interstate 15 and the Wasatch Front to the northwest and Interstate 70 to the southeast. Within the Project Area, Highway 6 is a paved divided four-lane highway serving the communities of Helper, Price, and Wellington. Despite its regional significance, traffic volumes along this highway are modest, relative to its capacity, averaging roughly 9,500 vehicles per day on the west side of Price in 1994.

State Route 10 also runs north-south and provides the primary means of access to the central and southern portions of the proposed CBM development area. This two-lane paved highway extends from Price and the CBM development area south to the Project Area communities in Emery County and Interstate 70 to the southwest. In general, traffic volumes along this highway are low due to the sparse population of the area it serves. In 1994, average daily traffic on this highway was approximately 5,055 vehicles per day in the Emery County portion of the Project Area.

State Route 122 runs east-west from SR 10 to Hiawatha and provides access to the south-central portion of the proposed CBM development area near the Carbon-Emery County line. Traffic volumes along this two-lane paved highway are also low due to the sparse population of the area it serves. In 1994, average daily traffic on this highway was approximately 1,370 vehicles per day.

Local Roads. Local roads within the Project Area are extensive and comprise a mix of county roads, City of Price roads, subdivision roads, BLM roads, and roads recently constructed by RGC for development of CBM wells and pipelines. In general, maintenance of local roads has been the responsibility of the entity that owns them, although RGC has done a considerable amount of maintenance work on the county roads it has used to date.

Traffic volumes on local roads that serve the proposed CBM development area are low due to the fact that the area is very sparsely inhabited. Traffic on these local roads is generally associated with maintenance of existing CBM wells, ranching activities, and recreation. Although local roads that serve inhabited areas are plowed in the winter, wet weather can render unpaved roads virtually impassable for short periods of time.

Other Transportation Systems. Rail service in the Project Area is provided by the Southern Pacific Railroad, which maintains a track that runs from the north end of the Project Area through Helper, Price and Wellington and continues east. In addition, the Utah Railway operates a spur in the western portion of the Project Area which serves the coal mining industry. This spur runs from Helper to Wattis and Hiawatha. In addition, passenger rail service is available to Helper on Amtrak.

Air service in the Project Area is available at the Carbon County Airport, east of Price, and the smaller Huntington Airport in Emery County. These airports primarily serve freight traffic and private aviation. The only passenger service available to the public is through a charter service at the Carbon County Airport.

3.11 LIVESTOCK MANAGEMENT

3.11.1 Regional Overview

Livestock grazing is one of the primary agricultural land uses within the Project Area. The BLM manages 28 grazing allotments which are either completely or partially within the Project Area. These allotments are shown in Plate 23. Table 3.11-1 provides information on the grazing allotments, including total acres of the allotment, AUMs (animal unit months), acres required to produce an AUM in each allotment, livestock type, period of use, BLM management category, and ecological range condition.

Grazing capacities are indicated by AUMs. An AUM represents the number of pounds of forage necessary to sustain one cow or its equivalent for a period of one month. Equivalent animal units for one AUM in the Project Area are 1 cow, 5 sheep, 8.9 mule deer or 9 antelope. The number of acres required to produce an AUM can vary greatly between the different allotments depending on the available plant production within a given vegetation type. Vegetation types within the Project Area vary from a predominately pinyon-juniper and sagebrush-grass type in the western portion to a mostly salt desert type in the eastern and southeastern part of the Project Area. As shown in Table 3.11-1, the acres necessary to produce one AUM varies greatly between the allotments, with acres per AUM on public lands ranging between 134 acres in the Peterson allotment down to 6 acres in the Trail Canyon allotment. Private and state lands are estimated to have similar carrying capacity as nearby public lands.

Cattle and sheep are the primary livestock type grazed in the allotments. Time of use varies, with several of the allotments being used in the spring and early summer, and others being used in the fall or during the winter months. The ecological condition of the range is expressed as seral stage in relation to the range site potential. Potential Natural Community (PNC), and late, mid and early seral are the classifications used, which generally correspond to the excellent, good, fair and poor ratings, respectively. A little over half (about 53 percent) of the public land acres within the grazing allotments is rated as being in the mid-seral (fair) condition.

The BLM classifies the grazing allotments into three different management categories depending on such factors as range condition, resource use conflicts, opportunity for positive economic return, and whether or not the present management of the allotment appears to be satisfactory or unsatisfactory. This management classification was established to establish priorities for distributing available funds and personnel in a manner that will achieve cost-effective improvement of rangeland condition and production. The three management categories are Maintain, Improve and Custodial. Maintain category criteria include a range condition that is satisfactory; production level near their potential; no serious resource use conflicts; and management that appears to be satisfactory. Improve category criteria include a range condition that is unsatisfactory; low to moderate production levels; serious resource use conflicts; opportunity for positive economic return; and management that appears to be unsatisfactory. The custodial category criteria include a range condition that is not a factor; production levels near their potential; limited resource use conflicts; little opportunity for positive economic return; and a present management that appears to be satisfactory.

3.11.2 Carrying Capacity, Livestock Management and Facilities

As described in Section 3.11.1, carrying capacity is indicated by AUMs, which are shown for each allotment in Table 3.11-1. The number of AUMs an allotment can produce is related to several factors including soil productivity, vegetation type and quality (for forage value), ecological range condition, and availability of water. Any reduction in the amount or quality of these factors can have a negative effect on the carrying capacity of the allotment.

Livestock operators use the existing road network to move cattle to the allotments and to access the allotment to check on their livestock, fix fences, inspect water tanks, distribute salt and other maintenance activities. Any restrictions in the ability of livestock operators to access the allotments would impact their ability to perform the necessary livestock management activities.

The grazing allotments contain various range improvements which are used to control animal movement and to provide water for livestock. Improvements include fences, cattleguards, corrals, developed springs and wells, detention dams, reservoirs, and water pipelines. In some areas pinyon-juniper has been chained to encourage herbaceous forage plants. Disruption of these range improvements could impact the control of livestock on the established grazing allotments.

3.12 RECREATION

3.12.1 Regional Overview

Recreational opportunities within the Project Area encompass a range of dispersed uses such as hunting, fishing, hiking, jogging, mountain biking, and wildlife viewing on public federal and state lands that are in close proximity to the local communities. Developed recreational areas provide opportunities for golfing, shooting and target practice and picnicking.

Recreational uses of public lands are typically documented by federal agencies through the Recreation Opportunity Spectrum (ROS) inventories. Information on recreational uses within and adjacent to the Project Area is based upon the USFS ROS inventories and supplemental data provided by the counties, BLM, and USFS.

Dispersed recreational activities occurring on public lands include hunting, mountain biking, off-road vehicle activities, hiking, horseback riding and wildlife viewing. The proximity and accessibility of public lands to local communities enhances the types of activities that occur within the Project Area. Public lands of greatest local concern to residents include (1) lands east and north of the Project Area (located between Price and Kenilworth) which are used extensively by local residents for biking, hiking and jogging; (2) lands west of Price, where hunting and wildlife viewing activities are common in the winter and horseback riding and four-wheeling occur during other seasons; and (3) portions of the Manti-LaSal National Forest, located adjacent and west of the Project Area that are used for hunting, hiking, and mountain biking. National Forest lands are also used during the summer for family reunions and picnics. National Forest lands west of the Project Area are classified as "semi-primitive motorized" and "roaded natural appearing" in the ROS inventory. Scenic drives are also afforded by several state and federal scenic byways, including State Routes 31 and the Nine Mile Canyon Road, a BLM scenic byway. Nine Mile Canyon Road is outside the Project Area while State Route 31 cuts across the southwestern edge of the Project Area.

3.12.2 Recreational Opportunities

Dispersed recreational uses occur throughout the public lands that are administered by the BLM, USFS, and State of Utah. Areas of more concentrated use include the area between Price and Kenilworth which is currently used for mountain biking and annual mountain bike races, and areas used for wildlife viewing and scenic touring. In recent years, there has been increased interest in developing the area's mountain biking potential as a tourism attraction. As part of the comprehensive planning efforts taking place in Carbon County, the county is conducting a regional bike trails study in coordination with BLM and the USFS. Presently, a number of BLM trails are used regularly by locals. Several bike races are also sponsored annually that draw bikers from a larger region. These biking events include a National Off-Road Bicycle Association (NORBA) bike race, known locally as the Butch Cassidy Blow Out Mountain Bike Race. This race takes place northeast of Price, outside the Project Area. Within the Manti-LaSal National Forest, biking trails closest to the Project Area consist of portions of the Castle Valley Ridge Trail System, located west of the Project Area. Areas of known dispersed recreational activity were used as the sensitivity units for this issue.

Carbon County recently approved a county trails plan (Keleher 1995) which identifies trail corridors within Carbon County available for public recreation use. Most of the planned trails within the Price CBM Project Area are existing roads and trails that would become a designated system of trails through trail development and maintenance, standardized trail signing, trailheads and other facilities. Plate 22 (Land Use map in Section 3.10) shows the location of the planned county trail corridors in the vicinity of the Project Area. The major planned trails include the Wood Hill-Kenilworth loop, the Helper to Kenilworth link, the Price River Parkway System, the Pinnacle Peak/Gordon Creek/Consumers Road Loop, and a loop trail in the North Spring Canyon/Horse Bench area, off the main road to Wattis. Trails would provide for different types of use including roadways for 2-wheel drive/low clearance vehicles, roadways that would likely require 4-wheel drive/high clearance vehicles, trails for motorized/off-highway vehicles (OHV), trails for non-motorized travel and trails for non-mechanized travel. As mentioned above, the Wood-Hill-Kenilworth loop is currently a very popular trail system, especially for mountain biking. The Pinnacle Peak/ Consumers Wash loop is also a popular road to view wildlife and to access hunting areas and hiking trails on the Manti La-Sal National Forest west of Price. Current users tend to be local residents, and the availability of close by recreational opportunities is an important factor in the quality of life of local residents. OHVs are a popular form of recreation, with current registrations available from the Department of Motor Vehicles showing approximately 1,095 ATVs and 337 snowmobiles registered in Carbon County.

Developed recreational areas similarly serve as resource sensitivity units for recreation (see Plate 22). Developed recreational sites within or near the Project Area include community parks, the Four-Mile, Pinnacle Peak and Black Powder Shooting Ranges, the Carbon County Country Club and Golf Course, and the Carbon County Fairgrounds.

Hunting for deer, elk, mountain lion, and small game is a popular activity within the study area. The UDWR estimates the amount of hunting activity occurring within the various wildlife management units across the state. Management units vary by species. The Project Area is within the North Manti Management

Unit for deer, the Manti Management Unit for elk, and the East Manti Management Unit for mountain lion. Between 1990 and 1994 estimates on hunter days for deer ranged from 5,000 to 23,000. The herd has been declining in recent years. Hunter days for elk ranged between 19,500 and 23,800 from 1990 to 1994. Recently there were 274 hunter and pursuit days for mountain lion within this management unit. Hunter use data are not available for small game.

3.13 VISUAL RESOURCES

3.13.1 Regional Overview

Landscape Characteristics

The visual characteristics of the Project Area are created by the influences of landform, vegetation, and water on the line, form, color and texture of the landscape. The Project Area consists of the western-most section of the Colorado Plateau physiographic province, and lies adjacent and east/south of the structural limits of the Wasatch Plateau. The eastern boundary of the Wasatch Plateau is formed by an abrupt wall of barren cliffs and steep slopes, broken only by the mouths of large canyons. To the north and east of the Project Area lies the Roan Cliffs and Book Cliffs. The landscape character of the Project Area is influenced by these adjacent cliffs and the Wasatch Plateau escarpments, which are viewed as background features from most roadways and towns within the Project Area. Overall, the surrounding cliffs and escarpments form a dramatic series of sandstone escarpments that reach 8,500 to 9,000 feet amsl and support little vegetation, thus exposing the multi-colored layers of sandstone.

Within the Project Area elevations range from 5,400 to 7,800 feet amsl and landforms consist of a series of table tops, benches, and drainages, intermittent prominent peaks, and pinnacles, and broad river valleys. Topographically, the landscape is mostly composed of gently rolling hills and benches that surround the broad Price River and Castle valleys. South of the Book Cliffs are a series of northeast-to-southwest trending benches and drainages, including Porphyry Bench, Pinnacle Bench and Horse Bench that are separated by shallow canyons, such as Wildcat, Haley, Pinnacle, and Horse canyons. Benches and table tops typically form the middleground views from most of the developed valley areas. Elevations range between 6,300 feet and 7,100 feet amsl along the benches and 6,000 feet to 6,100 feet amsl along the bottoms of the canyons. Gordon Creek and Miller Creek trend east-west across this part of the Project Area, providing intermittent water drainage. Vegetation patterns typically form a homogeneous texture of low-profile grey green sagebrush scrub, that provide open visibility conditions. Pinyons and junipers occur at the higher elevations, enhancing the scenic quality of the landscape as well as providing greater visual screening.

The Price River Valley and Castle Project Valley stretch across the central part of the Project Area in a north-south direction. Elevations in the valleys typically range from 5,300 to 5,600 feet amsl. The valleys have largely been developed for rural agricultural, industrial and community uses. The Price River is the most evident natural feature in the valley, along with several prominent hills, including Woodhill that adjoins the city of Price to the north and west.

Scenic Quality

In response to the FLPMA and NEPA, the BLM developed and instituted the Visual Resource Management (VRM) system in the mid 1970s to document and manage visual

resources on public lands. The VRM system identifies management classes that permit various levels of landscape alteration. In conjunction with other BLM resource programs, VRM classes are determined based upon the scenic quality of the landscape, viewer sensitivity to the landscape, and the distance that the landscape would be viewed.

Overall, there are four BLM VRM Classes – Class I through IV. The objectives of these classes vary from very limited activity to activity that allows major landscape modifications. Federal lands within the Project Area have been designated by BLM as VRM Classes III and IV. Within the Project Area, approximately 44 percent of the surface lands are under the jurisdiction of the BLM. See Plate 24 (VRM Map). The Class III and IV designations are officially used as a management tool for the BLM-administered lands. As part of the inventory process conducted in the late 1970's, the BLM also evaluated private and state lands. Class III and IV categories were identified by the BLM for private and state lands, based upon similarities in landscape characteristics with nearby federal lands. Based upon recent (June 1996) field reviews, however, many private and public lands have increased in sensitivity over the past 20 years and would qualify as VRM Class II or III today. Landscapes considered to meet Class II or III VRM standards include lands within foreground distance of residential areas, primary highways, and recreational trails. The objectives of these classes are as follows:

- Class II - Class II provides for activities that would not be evident in the characteristic landscape. Contrasts are seen, but must not attract attention.

- Class III - The objective of Class III is to provide for management activities that may contrast with the basic landscape elements, but remain subordinate to the existing landscape character. In Class III areas, activities may be visually evident, but should not be dominant.

- Class IV - The objective of Class IV is to provide for management activities that may require major modifications to the existing landscape. The level of change to the landscape can be high and may be visually dominant.

BLM Class III areas are predominantly associated with the natural appearing escarpments and ridgelines that surround the Price River Valley. The scenic quality of these landscapes is considered to be typical of the region. The majority of BLM lands have been categorized as Class IV. Class IV is identified in areas where visibility is reduced due to distance and topography and areas developed for mineral extraction or use. Class II/III landscapes correspond to landscapes within a foreground distance of residential, highways, and recreational uses. Figure 3.13-1 a through d shows representative photographs of landscape quality.

Adjacent and west of the Project Area, the USFS has designated the Visual Quality Objectives (VQO) for the Manti-La Sal National Forest. Lands closest to the Project Area are designated as Partial Retention and Modification VQOs. The majority of lands are classified as Modification, with areas of Partial Retention found along Gentry Mountain. The definitions of these two classes are as follows:

- Partial Retention VQO - Activities in Partial Retention VQO areas may be evident to the casual observer, but should remain subordinate to the surrounding landscape. Management activities that take place may introduce

form, line, color and textures that are infrequently or not found in the characteristic landscape, but should remain visually subordinate to the surrounding landscape.

- Modification VQO - Activities may visually dominate the surrounding landscape. However, activities should borrow from the naturally established form, line, color and texture so that its visual characteristics are compatible with the natural surroundings.

Visual Sensitivity

Specific areas of public/agency concern for the visual environment were researched through discussions with BLM, the Forest Service, and Carbon County.

Within the Project Area and surrounding vicinity the following areas, termed Key Observation Points (KOPs), were identified as being visually sensitive to change:

- Communities - including Price, Wellington, Elmo, Spring Glen and Carbonville

- Dispersed and Rural Residential Areas - occurring primarily in the eastern half of the Project Area, particularly south and west of Price, west of Elmo and along Gordon Creek Road.

- Recreation Areas - within the Project Area recreation primarily occurs on public lands and consists of a variety of dispersed activities such as hunting, biking, horseback riding, scenic drives and target shooting. Areas of particular concern to local residents include public lands that provide a natural rural or remote experience within close proximity to Price and other communities. These areas include: Woodhill, lands between Kenilworth and Price, Consumer Wash Road, Gordon Creek Road and the Gordon Creek Wildlife Management Area, Pinnacle Creek Road, Pinnacle Bench, Horse Bench, and Porphyry Bench.

  Designated recreation areas of visual concern include trails along Pinnacle Bench and Porphyry Bench that have been recently incorporated into the County's trail system, the Carbon County Fairgrounds, and the Carbon County Country Club.

- Transportation Corridors - including primary and secondary travel routes. Within the Project Area these include State Highway 6, 10, 155, 122 and 31 and a number of public local roads administered by the County and/or BLM.

Plate 22 shows the location of most of these visually sensitive areas. Reference should be made to the Recreation Section for more information on the location of dispersed recreation activities.

Regional Haze

Regional haze is caused by diminished air quality conditions and causes a degradation of visual quality. This issue is addressed in Section 3.3 of this EIS.

3.14 NOISE

3.14.1 Regional Overview

The Project Area has land uses that vary from sparsely populated rural regions to more density populated, urbanized areas. The National Academy of Sciences (NAS) and EPA have developed expected noise levels based upon population density as shown in Table 3.14-1 and Figure 3.14-1. The population of Carbon and Emery Counties, based on 1990 census data, were 14 and 3 people per square mile, respectively. Based on these density levels, ambient noise in most areas is expected to range from 35 to 40 dB. However, noise levels in the more urbanized areas, such as towns, will be higher. Based on noise monitoring conducted for Amoco's San Juan Coal Degas Project (WCC 1988), L_{dn} levels in Ignacio, Colorado were found to be approximately 62 dBA.

Decibels (dB) are the unit of measure used to represent sound pressure levels, and dBA is the unit of measure used to represent sound pressure levels using the A-Weighted Scale. The A-Weighted decibel measure is used to evaluate ambient noise levels, and common noise sources. It is a measure designed to simulate human hearing by placing less emphasis on lower frequency noise because the human ear does not perceive sounds at low frequency in the same manner as sounds at higher frequencies. For example, low frequency sound is not perceived as loud as a sound of equal intensity at higher frequency.

Ambient noise levels may also be expressed using the decibel and the Ldn scale (National Academy of Sciences 1977). The Ldn scale is a logarithmic average of daytime and nighttime decibel levels with a ten dB penalty applied to nighttime levels. This penalty reflects the fact that nighttime noise levels are more irritating to humans than daytime sounds.

In order to better quantify expected maximum existing noise levels in the Project Area, baseline noise monitoring was conducted. Results are presented in Table 3.14-2. Fifteen minute noise levels were monitored downwind and upwind from drilling activity. Downwind levels ranged from 45 dBA at a distance of 3300 feet to 80 dBA at a distance of 150 feet. Upwind levels ranged from 69 dBA at a distance of 350 feet to 77 dBA at a distance of 150 feet. At the closest residence to this activity, daytime levels were 44 dBA and nighttime levels were 28 dBA.

3.15 SOCIOECONOMICS

3.15.1 Regional Overview

The socioeconomic Project Area described in this section includes communities in Carbon and Emery Counties that either lie within the area that is proposed for CBM development or are within reasonable commuting distance. Relevant socioeconomic factors to be discussed include population, housing, employment, community facilities and services, local government fiscal conditions, regional economics, and general quality of life. These socioeconomic factors are most likely to be affected in the communities closest to CBM development or where local facilities and services would be utilized by CBM activities and/or CBM workers.

In Carbon County, the communities of Price, Helper, Wellington, Carbonville, East Carbon, and Sunnyside are included in the socioeconomic Project Area. In Emery County, the socioeconomic Project Area includes the communities of Castle Dale, Orangeville, Huntington, Cleveland, and Elmo.

3.15.2 Socioeconomic Resource Components

3.15.2.1 Population

From 1980 to the present, population levels have fluctuated considerably in both Carbon and Emery Counties. In the early 1980s, the Project Area population grew steadily and peaked in 1983 at 24,100 in Carbon County and 12,700 in Emery County. From 1984 through 1990, the populations of both counties declined significantly. By 1990, Carbon County had 20,200 residents and Emery County had 10,300 residents. This represents population declines of 16 percent and 19 percent respectively in those counties. This population decline was due primarily to high unemployment that was experienced in the Project Area resulting from a decline in the mining and energy industries, as well as a nationwide recession. Although the counties experienced a natural increase in population (births minus deaths), this increase was offset by sizable net outmigration of residents.

Since 1990, however, the populations of both counties have grown modestly. In 1993, Carbon County had 20,700 residents and Emery County had 10,400 residents, representing an increase of roughly 1 to 2 percent since 1990 (Utah Office of Planning and Budget 1994). Long-term estimates project modest population growth in both counties (Knold 1993). Figure 3.15-1 presents a graph of population trends from 1980 to 1994.

3.15.2.2 Local Economy, Employment and Income

The economies of Carbon and Emery counties have experienced considerable swings over the last fifteen years. These counties have been significant producers of coal, and changes in the coal mining industry and energy markets have had a substantial effect on the local economy. In the late 1970s and early 1980s, when the energy market was relatively strong, the economy and population of the Project Area grew steadily in response to availability of skilled jobs offering good pay. During those years, employment in the mining industry reached an all time high, while construction of several coal fired power plants also created numerous construction jobs.

However, starting about 1982, the national recession, combined with the decline of the energy market, increased mechanization of coal mining operations, and closure of other coal mines caused a substantial reduction in employment in the Project Area. In 1983, unemployment in Carbon and Emery Counties soared to 21 percent and 17 percent respectively (Knold 1993). In the years following 1983, unemployment tapered off gradually to about 8 percent in 1990, only to rise again to about 9 percent in 1992 due to continued decline of the mining industry and economic recession experienced nationwide. Figure 3.15-2 illustrates changes in the unemployment rate from 1980 to the present.

Since 1992, Carbon County has shown steady growth in employment opportunities. In the third quarter of 1994, for example, employment increased by 2.8 percent or 200 positions, increasing total non-farm employment to 7,864 (Utah Department of Employment Security 1994). This recent growth in employment has been experienced in virtually every employment sector except the mining industry. Employment sectors that experienced the strongest growth were the manufacturing, service and retail trade areas. In the fall of 1994, unemployment in Carbon County was roughly 6.0 percent (Utah Department of Employment Security 1994). Within the Project Area, the vast majority of commercial activity is centered in Price and Carbon County, with

relatively modest commercial business activity in the towns within Emery County. In recent years, there has been considerable growth in commercial business activity in Price.

In general, Emery County has experienced more modest economic growth in recent years because growth in the service and retail sectors has not occurred as it has in Carbon County. The local government and construction sectors added new jobs in Emery County, while employment declines were experienced in the TCU (transportation, communication, utilities), retail trade, and service sectors. The overall result has been a modest increase of 37 jobs in the last year or a 1 percent growth in nonfarm employment. In the fall of 1994, unemployment in Emery County was roughly 6.5 percent (Utah Department of Employment Security 1994). Although employment conditions have generally improved in Carbon and Emery Counties over the last ten years, they have experienced higher unemployment rates than the State of Utah and nation almost continuously.

It is important to note that the economies of Carbon and Emery Counties are substantially different in their composition. The most notable difference is the relatively small size of the retail trade and service industries and relatively large size of mining and utility (TCU) sector employment in Emery County. Employment in Emery County is dominated by the mining (26 percent), government (24 percent), and TCU (22 percent) sectors, which provide 75 percent of the employment opportunities in the county. In terms of earnings, roughly 73 percent of income came from the mining and TCU sectors, which reflects the higher wages earned in those sectors. Only 6.6 percent of earnings were derived from the trade and service sectors. By contrast, the largest employment sectors in Price and Carbon County include government (32 percent), trade (27 percent), and services (23 percent), which comprise 82 percent of employment opportunities. Mining comprises approximately 12 percent of employment in Carbon County. The role of Price as the regional trade center is reflected in the fact that 41 percent of total earnings in Price were derived from trade and services. Thus, while employment growth and general economic diversification has occurred at a faster rate in Carbon County, the relatively large percentage of higher-paying mining and utility jobs in Emery County results in higher average monthly earnings ($2,509 in Emery County; $1,688 in Carbon County) (Utah Department of Employment Security 1994).

Relative to Carbon and Emery counties, the economics of the State of Utah and nation as a whole are quite different. In both the state and nation, mining employs just 1 percent of the work force, versus 12 percent and 26 percent in Carbon and Emery counties. Employment in the TCU sector in the state and nation comprises just 6 percent and 5 percent of total employment, respectively, versus 22 percent in Emery County. This comparison reflects the continued importance of coal mining and electric power generation in the Project Area, although given the recent growth in the trade and service sectors in Price, the economy of Carbon County is becoming more and more similar to the state and nation as a whole (Utah Office of Planning and Budget 1994). Accordingly, per capita income in Carbon County ($1,688 per month) is similar to the State of Utah ($1,431) and nation ($1,808), while it is considerably higher in Emery County ($2,509).

Tourism is also growing in Carbon and Emery counties, and is considered to be an important part of an increasingly diversifying economy. Attractions that draw tourists to the area include Ninemile Canyon, the San Rafael

Swell, and other public lands. Recreational activities enjoyed by visitors to the Project Area include hunting, off-road vehicle use, wildlife observation, Indian rock art viewing, hiking, mountain biking and other activities. In addition, the College of Eastern Utah's Prehistoric Museum and the Cleveland-Lloyd Dinosaur Quarry also attract visitors to Price and the Project Area. Given the generally sparse population and lack of services in the Project Area and surrounding region, Price is the primary source of motel accommodations, restaurant meals, fuel, and other goods and services utilized by tourists visiting these attractions. The abundance of recreational opportunities in and around the Project Area not only attracts tourists, it also contributes to the quality of life for Project Area residents.

Since 1994, RGC has employed local area residents to staff the early stages of its CBM development project. To date, about 89 CBM wells have been completed to the west of Price on State and privately-owned lands. At present, this work employs about 81 local workers, and 83 non-local construction contractors during the May to November construction season. During the winter months, employment drops to about 20 positions to operate and maintain the CBM field. Current local area resident employment is comprised of about 63 construction workers, who generally build project roads and install gas pipelines and utility (water and electrical) lines, and about 18 year round RGC employees, who are responsible for operating and maintaining the completed CBM wells and staffing the Price office. Non-local, or transient construction workers are used because of the need for specialized expertise in drilling and completed the CBM wells. These transient workers reside in motel accommodations while they are working in the local area and do not bring their families with them.

3.15.2.3 <u>Housing</u>

In 1994, housing units in communities in the Carbon County portion of the Project Area comprised a total of roughly 5,025 single family homes, 172 duplexes and fourplexes, 428 apartments, and 1,082 mobile homes. In general, the vacancy rate for housing in Carbon County is roughly 4.0 percent. This low vacancy rate is particularly pronounced in the lower to middle cost rental housing markets. Apartments, duplex/fourplex, and lower cost single family homes are in very short supply at the present time partially due to the strong demand for these types of housing generated by students at the College of Eastern Utah. Construction of a proposed 65 unit dormitory in 1996 may relieve this tight part of the housing market to some extent. In 1995, the cost of renting a home ranged from about $200 to $800, with an average rent of $300. The average sales price for a home in Carbon County was $53,582 (Southeastern Utah Association of Local Governments 1993 and 1995). Table 3.15-1 presents a more detailed breakdown of housing types and vacancies in the various communities in the Project Area.

Numerous sources of temporary housing are also available in the Project Area for potential project contractors. Some examples include motels, mobile home parks, and campgrounds. As mentioned previously, the current non-local construction crew utilizes motel accommodations during the construction season. At present, there are approximately 570 motel rooms available in Price, Wellington, and Helper, with an additional motel under construction. There are also five mobile home parks in the Carbon County portion of the Project Area with an estimated capacity of 300

spaces. Some of these parks can accommodate both mobile homes and RVs.

In communities in the Emery County portion of the Project Area, the total housing supply comprises roughly 1,458 single family homes, 148 duplexes and fourplexes, just 47 apartments, and 441 mobile homes. In general, the vacancy rate for housing in the Emery County portion of the Project Area is slightly higher than Carbon County, at roughly 5 percent. In 1995, the cost of renting a home in Emery County ranged from about $175 to $750, with an average rent of $250. The average sales price for a home was $47,000. Temporary housing is more limited in Emery County than in Carbon County, with a modest number of motel rooms and mobile homes spaces available in the various Project Area communities (Southeastern Utah Association of Local Governments 1993 and 1995).

3.15.2.4 Public Facilities, Services, and Local Government Fiscal Conditions

Public Facilities and Services in Carbon County

The following information was derived from interviews with local government officials, including the Carbon County Planning Department, Carbon County Future, the Carbon County School District, and the Southeastern Utah Association of Governments.

Public Schools. Within the communities in the Project Area portion of Carbon County, there are four elementary schools, three secondary/junior high schools, and one high school. At present total enrollment in these schools is approximately 4,505 (Utah State Office of Education 1994). In terms of capacity, virtually all of the elementary schools, Helper Jr. High School, and Carbon High School are nearing capacity. Although school enrollment declined for several years, that trend has reversed, with increases in enrollment observed in many grade levels over the last two years (Bush 1996).

Medical Facilities. The largest medical facility in the Project Area is Castleview Hospital in Price, which is staffed by numerous general and specialized physicians and nurses. The hospital provides 24-hour emergency service, ambulances, and helicopter service. Other medical facilities in Carbon County include a recently opened pediatric clinic, an elderly care clinic, an office of the Southeastern Utah Health Department, and two nursing homes and one residential care center.

Law Enforcement and Fire Protection. Within the Carbon County portion of the Project Area, law enforcement is provided by local police departments in the Cities of Price, Helper, and Wellington. Unincorporated areas are served by the Carbon County Sheriff's Department. In addition, the Utah Highway Patrol also serves Carbon County. Fire protection services are provided by the City of Price, or other local volunteer fire departments in Helper and Wellington.

To date, security in the existing RGC CBM field has been handled internally by RGC. The company has staff that patrols the field at night. According to the Carbon County Sheriff's Office, the CBM field is not patrolled by the Sheriff's office, and law enforcement services have only been requested by RGC in response to occasional vandalism of CBM facilities (Robertson 1996).

Utilities. In Carbon County, electricity is provided by Utah Power and Light. Natural gas is provided by Mountain Fuel. Both of these utility services are modern and have adequate capacity for future growth.

Water Supply and Wastewater Treatment. Water is provided to the various communities in Carbon County by the PRWID and local water districts. The PRWID presently provides all potable water to the City of Wellington, and communities in unincorporated Carbon County, such as Spring Glen and Carbonville. The Cities of Price and Helper have their own water supplies. On occasion, the PRWID provides supplemental water to Price and Helper. Although the PRWID's potable water plant operates at capacity during hot summer weather, a proposed expansion of the plant from 4 million gallons per day (Mgd) to 6 Mgd will be completed around August of 1997 (Snook 1996). With that expansion, the PRWID should have ample capacity to handle potential future growth in water demand.

Wastewater treatment for the entire Carbon County portion of the Project Area is also handled by the PRWID. At present the wastewater treatment plant is operating well below its design capacity of four Mgd. Currently, typical flows at the treatment plant are approximately 2.1 - 2.2 Mgd (Richins 1996).

Public Facilities and Services in Emery County

The following information was derived from interviews with local government officials, including the Emery County School District and the Emery County Planning and Zoning Office.

Public Schools. Within the communities in the Project Area portion of Emery County there are four elementary schools, one secondary school, and one high school. At present total enrollment in these schools is approximately 2,219 (Utah State Office of Education 1994). In terms of capacity, all of the elementary schools have room to accommodate additional students, while Canyon View Secondary School is near capacity and Emery County High School is presently over capacity.

Medical Facilities. The Emery County portion of the Project Area includes one emergency medical clinic and one nursing home and one residential care center. The nearest hospital, Castleview Hospital, is located in Price and has an 88-bed capacity.

Law Enforcement and Fire Protection. The Emery County Sheriff's Department and Utah Highway Patrol provide law enforcement services in Emery County. The Sheriff's Department currently includes approximately 37 officers and 25 patrol vehicles. The Utah Highway Patrol has approximately 6 patrol vehicles on duty in the county. Fire protection is the responsibility of the Special Service District, which is staffed by approximately 87 volunteer firemen, who are equipped with 30 fire trucks.

Utilities. In Emery County, electricity is provided by Utah Power and Light. Natural gas is provided by Mountain Fuel. Both of these utility services are modern and have adequate capacity for future growth.

Water Supply and Wastewater Treatment. Water and wastewater treatment services are provided by the Castle Valley Special Service District, which is currently operating well below its capacity.

Government Fiscal Conditions and Revenues from Coalbed Methane Activities

CBM developments contribute considerable revenue to various local, state and federal government entities through payment of royalties and taxes. The following is a summary of the types of revenues recently generated by the RGC project. Section 4.15

describes potential royalty and tax revenues that could be generated by the proposed project in the future.

State of Utah mineral lease royalties are collected for gas wells located on lands owned by the State of Utah. State royalty payments are based on the volume of gas produced. Depending on the type of state lands, royalties are either deposited into the state's school trust or the general fund. In 1995, state mineral lease royalty payments for the RGC project amounted to approximately $2,520,000.

Federal mineral lease royalties are collected for gas wells located on federally administered public lands. Federal royalty payments are also based on the volume of gas produced. Fifty percent of the revenue collected is returned to the State of Utah. The state then allocates one third of that revenue to the Permanent Community Impact Fund, from which cities in the Project Area, such as Price, Helper, and Wellington, can obtain funding from for various infrastructure-related projects. The state allocates another 25 percent to the county in which the gas was produced. In the Project Area, the local share of federal mineral lease royalty is paid to the Carbon County Road Special Service District to cover the cost of road maintenance and improvements. In 1995, federal mineral lease royalty payments for the RGC project amounted to approximately $45,000 to the State of Utah, of which approximately $11,250 was paid to Carbon County.

Severance Tax is levied against the proceeds of the sale of gas over the previous year of production less federal and state royalties paid. In 1995, severance tax paid by RGC amounted to approximately $444,000. Conservation Tax is also levied against the proceeds of the sale of gas. In 1995, conservation tax payments amounted to approximately $36,000. Ad Valorem Tax is levied by Carbon County on facilities and/or improvements constructed by RGC. In 1995, ad valorem taxes paid by RGC to Carbon County amounted to approximately $387,000.

Sales and Use Taxes are also paid as a result of purchasing activities within the Project Area. Examples of purchasing activities that generate sales tax revenue include gravel, pipe, motor fuel, and other supplies purchased locally. Although no specific sales tax contribution is available for presentation at this time, it estimated to be several thousand dollars annually.

3.15.2.5 <u>Social Setting and Quality of Life</u>

Residents of the Project Area enjoy numerous amenities associated with the abundance of open space accessible to the public. Wildlife viewing and hunting opportunities are available just minutes from home. A considerable network of roads and trails are available on public lands which support recreational activities, such as mountain biking, hiking, horse riding, and off-road vehicle use. Informal discussions with local area residents and elected officials has revealed that many residents of the Project Area value having quality recreational opportunities in the areas surrounding local towns and would like to see them protected.

In an effort to continue to attract retirees and other new residents to the Project Area, as well as promote tourism in the area, local government agencies, such as the Carbon and Emery County Planning Departments, Carbon County Future, and other organizations have expressed an interest in protecting the attractiveness of Project Area communities and surrounding open space areas. For CBM projects, such as the one proposed by RGC, the local government agencies have stated that by maintaining wellsites and project facilities in such a way that surface disturbance and the debris are minimized, impacts to the attractiveness of the overall region could be minimized. In maintaining the attractiveness of the region, it is believed current residents will continue to enjoy a high quality of life and tourists and potential new residents will be attracted to the area in the future.

3.16 HEALTH AND SAFETY

Health and safety issues are addressed in Section 4.16.

TABLE 3.2-1

STREAMFLOW DISCHARGE DATA
(in vicinity of Project Area)

Location	Data Year(s)	Average Flow (cfs)	Source
UDWQ-1 Price River @ Helper	1985	64	UDWQ
UDWQ-1 Price River @ Helper	1994-95	102	UDWQ
UDWQ-2 Price River abv Wellington	1985	129	UDWQ
UDWQ-2 Price River abv Wellington	1994-95	29	UDWQ
Price River @ Woodside	1989-1994	54.33	USGS[1]
USGS-1 Price River near Heiner	1935-69, 80-81, 91-95	109	USGS
UDWQ-1 Price River @ Helper	1985-95	>110	UDWQ
UDWQ-4 Huntington Creek @ Huntington	1985-95	17.5	UDWQ
USGS-2 Huntington Creek @ Huntington	1979-80, 1986-95	74.1	USGS
2-2-W N Fork Gordon Creek	1985, 87-92	0.4	UDOGM
UDWQ-5 Gordon Creek abv Price River	1989, 90-93, 95	<3.3	UDWQ
UDWQ-6 Cottonwood Creek @ U-10	1985-95	14.8	UDWQ
ST-05 Miller Creek	1978-84	1.2	UDOGM
ST-06 Cedar Creek	1978-84	0.9	UDOGM
USGS-3 Ferron Creek @ Ferron	1912-23, 48-95	66.7	USGS
UDWQ-7 Ferron Creek @ U-10	1985-95	27.8	UDWQ

[1]Source: U.S. Geological Survey (USGS) Water Data Reports for Utah, Water Years 1989-1994.
UDWQ = Utah Division of Water Quality
UDOGM = Utah Division of Oil, Gas and Mining

TABLE 3.2-2
SURFACE WATER QUALITY DATA
(in vicinity of Project Area)

Location	Data Year(s)	Average TDS (mg/L)	Average Cl (mg/L)	Source
UDWQ-1 Price River @ Helper	1985	323		UDWQ
UDWQ-1 Price River @ Helper	1994-95	287		UDWQ
UDWQ-2 Price River abv Wellington	1985	987		UDWQ
UDWQ-2 Price River abv Wellington	1994-95	1740		UDWQ
UDWQ-3 Price River blw Wellington	1985	1193		UDWQ
UDWQ-3 Price River blw Wellington	1994-95	2146		UDWQ
USGS-1 Price River near Heiner	1935-69, 80-81, 91-95			USGS
UDWQ-1 Price River @ Helper	1985-95	306	15.3	UDWQ
San Rafael/Green River	1989-94	2,836[1]		USGS[2]
Price River @ Woodside	1989-90, 92-93	2,532[1]		USGS[2]
UDWQ-4 Huntington Creek @ Huntington	1985-95	2595	43.9	UDWQ
USGS-2 Huntington Creek @ Huntington	1979-80, 1986-95			USGS
2-2-W N Fork Gordon Creek	1985, 87-92	359	10.4	UDOGM
UDWQ-5 Gordon Creek abv Price River	1989, 90-93, 95	1102	30.2	UDWQ
UDWQ-6 Cottonwood Creek @ U-10	1985-95	1041	19.3	UDWQ
ST-05 Miller Creek	1978-84	861	29.3	UDOGM
ST-06 Cedar Creek	1978-84	601	8.7	UDOGM
USGS-3 Ferron Creek @ Ferron	1912-23, 48-95			USGS
UDWQ-7 Ferron Creek @ U-10	1985-95	812	27.8	UDWQ

[1] Total dissolved solids (TDS) estimated from Specific Conductance (K) using: K(μ5/cm)*0.86 = TDS (mg/l) where 0.86 is conversion factor obtained by correlating measured values of K and TDS for San Rafael River, Water years 1989-1990.
Cl = chloride

[2] Source: U.S. Geological Survey (USGS) Water Data Reports for Utah, Water Years 1989-1994.

UDWQ = Utah Division of Water Quality

UDOGM = Utah Division of Oil, Gas and Mining

TABLE 3.3-1

APPLICABLE STATE OF UTAH AND NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

Pollutant	Average Interval	Federal NAAQS ($\mu g/m^3$)	Federal Class II PSD ($\mu g/m^3$)	Utah AAQS ($\mu g/m^3$)
Sulfur Dioxide	Annual	80	20	80
	24-Hour	365	91	365
	3-Hour	1,300	512	-
PM_{10}	Annual	50	19	50
	24-Hour	150	37	150
Carbon Monoxide	8-Hour	10,000	-	10,000
-	1-Hour	40,000	-	40,000
Ozone	Annual	235	-	235
Nitrogen Dioxide	Annual	100	25	100

PSD = Prevention of Significant Deterioration

PM_{10} = Particulate matter, 10 microns or less in size

Source: Code of Federal Regulations (40 CFR 50)
Utah Division of Air Quality 1995

TABLE 3.3-2

MAXIMUM 24-HOUR PM_{10} CONCENTRATIONS
SUNNYSIDE, UTAH

Month	PM_{10} Concentration
<u>1994</u>	
July	23
August	26
September	30
October	20
November	12
December	11
<u>1995</u>	
January	21
February	11

PM_{10} = Particulate matter, 10 microns or less in size

TABLE 3.4-1

SOIL CHARACTERISTICS OF THE PRICE COALBED METHANE PROJECT AREA

Map Symbol	Soil Map Unit	Soil Series	Texture	Erosion Potential Wind	Erosion Potential Water	Slope Percent	Depth Class[1]	Salinity (mmhos/cm)	pH	Available Water Capacity (in/in	Permeability[2]	Percent Coarse Fragment[3]	Percent Organic Matter
	Carbon County												
1	Ravola- Billings-Hunting	Ravola	Loam, silt loam	Moderate	Moderate	1-6	Very Deep	2-8	7.4-9.0	0.13-0.17	Moderate	0	1-3
		Billings	Silty clay loam	Moderate	Moderate	1-6	Very Deep	2-8	7.4-9.0	0.15-0.18	Slow	0	< 2
		Hunting	Loam, silty clay loam	Moderate	Slight	1-3	Very Deep	2-16	7.9-8.4	0.10-0.16	Moderately slow-Moderate	0	1-2
2	Persayo-Chipeta-Badland	Persayo	Loam, silty clay lom	Moderate	Moderate	3-20	Shallow	< 8	8.5-9.0	0.09-0.18	Moderately slow-Moderate	0	0.5-1
		Chipeta	Silty clay loam, silty clay	Moderate	High	3-20	Shallow	8-16	7.4-9.0	0.11-0.16	Slow	0	< 2
		Badland	Shale, sandstone	--	--	--	--	--	--	--	--	--	--
5	Travessila-Strych-Stormitt	Travessila	Sandy loam, loam	Moderate	Moderate	1-8	Shallow	< 2	7.4-9.0	0.06-0.16	Moderate-Moderately rapid	0-10	1-2
		Strych	Loam, sandy loam	None	Moderate	3-15	Very Deep	< 2	7.4-9.0	0.08-0.16	Moderately rapid	20-45	0.5-3
		Stormitt	Sandy clay loam	None	Slight	3-10	Very Deep	< 2	7.4-9.0	0.08-0.15	Moderate	0-45	1-3
7	Strych-Gerst-Travessila	Strych	Loam, sandy loam	None	Moderate	3-30	Very Deep	< 2	7.4-9.0	0.06-0.11	Moderately rapid	30-45	0.5-3
		Gerst	Loam	None	High	3-40	Shallow	< 2	7.9-9.0	0.08-0.14	Moderately slow	0-25	< 1
		Travessila	Sandy loam	Moderate	High	3-40	Shallow	< 2	7.4-9.0	0.09-0.16	Moderate-Moderately rapid	0-10	0.5-1.0
12	Pathead-Curecanti	Pathead	Loam	None	High	50-70	Moderately Deep	< 2	7.9-9.0	0.04-0.08	Moderate-Moderately rapid	40-80	1-3
		Curecanti	Loam	Low	High	50-70	Very Deep	< 2	6.1-7.3	0.08-0.16	Moderate	0-50	3-5
	Emery County												
1	Chipeta-Killpack	Chipeta	Silty clay loam, silty clay	--	Moderate - High	1-30	Shallow - Moderately Deep	> 8	7.4-7.7	0.015-0.17	Slow	0	0.5-2.5
		Killpack	Clay loam, silty clay loam	--	Moderate - High	1-6	Shallow - Moderately Dcep	4-16	7.7-7.8	0.19-0.21	Slow-Moderate	0	1-2
2	Ravola-Billings-Penoyer	Ravola	Loam, sandy loam, clay loam	--	Moderate - High	1-10	Deep	0-16	7.7-7.9	0.17-0.19	Moderate-Moderately rapid	0	1-3
		Billings	Silty clay loam, loam, clay loam	--	Moderate - High	1-6	Deep	4-16	7.6-8.0	0.17-0.20	Slow-Moderately slow	0	1-3

TABLE 3.4-1

SOIL CHARACTERISTICS OF THE PRICE COALBED METHANE PROJECT AREA

Map Symbol	Soil Map Unit	Soil Series	Texture	Erosion Potential: Wind	Erosion Potential: Water	Slope Percent	Depth Class[1]	Salinity (mmhos/cm)	pH	Available Water Capacity (in/in	Permeability[2]	Percent Coarse Fragment[3]	Percent Organic Matter
		Penoyer	Loam, sandy loam	--	Moderate - High	0-10	Deep	0-8	7.7-8.2	0.17-0.21	Moderately slow - Moderately rapid	0	0.5-2
3	Saltair-Libbings	Saltair	Silty clay loam, silty loam	--	Slight	0-3	Deep	> 16	8.3-8.9	0.16-0.18	Slow	0	1-3
		Libbings	Silty clay loam, clay	--	Moderate	0-3	Moderately Deep	> 16	8.5-8.9	0.16-0.18	Slow	0	1-2
4	Sanpete-Minchey	Sanpete	Sandy loam, sandy clay loam	--	Moderate - High	0-10	Deep	< 2	7.8-8.1	0.10-0.13	Moderately rapid	10-20	< 2
		Minchey	Clay loam, sandy clay loam, sandy loam	--	Moderate	1-6	Deep	< 2	7.9-8.3	0.06-0.21	Moderate - Moderately rapid	0-5	< 1
5	Chipeta-Persayo-Badland	Chipeta	Silty clay loam, silty clay	--	Moderate - High	1-30	Shallow - Moderately Deep	> 8	7.4-7.7	0.15-0.17	Slow	0	1-2.5
		Persayo	Loam, silty clay loam,	--	Moderate	1-20	Shallow	4-16	7.5-7.7	0.17-0.19	Moderate- Moderately rapid	0	< 1
		Badland	Bare shale and sandstone	--	--	--	--	--	--	--	--	--	--

[1]
Shallow	10 to 20 inches
Moderately Deep	20 to 40 inches
Deep	40 to 60 inches
Very Deep	more than 60 inches

[2]
Slow	0.06 to 0.2 inches/hour
Moderately Slow	0.2 to 0.6 inches/hour
Moderate	0.6 to 2.0 inches/hour
Moderately Rapid	2.0-6.0 inches/hour
Rapid	6.0-20.0 inches/hour

[3] Percentage of coarse fragments greater than 3 inches.

-- Data not estimated or rated.

Source: USDA, SCS 1988, 1970.

TABLE 3.4-2

SOIL MATERIAL SUITABILITY CRITERIA FOR SALVAGE AND REDISTRIBUTION AS COVERSOIL[1]

Soil Property	Soil Quality			
	Good	Fair	Poor	Unsuitable
Texture	Sandy loam Loam Silt loam	Sandy clay loam Silty clay loam Clay loam	Sandy clay Loamy sand Silty clay	Clay > 60%
Coarse Fragment (% by volume)	0-10	10-20	20-35	>35
Organic Matter (%)	> 1.5	0.5-1.5	< 0.5	
Soil pH	6.1-7.8	5.1-6.1 7.9-8.4	4.5-5.0 8.5-9.0	< 4.5 > 9.1
Salinity (mmho/cm)	< 3	3-6	6-9	>9
Available Water Retention Capacity (in/in)	> 0.16	0.08-0.16	< 0.08	
Permeability	0.6-6.0	0.2-0.6	< 0.2 or > 6.0	

[1] Coversoil is soil material that can support the establishment of vegetation.

Source: USDA Forest Service 1979.

TABLE 3.5-1

SUMMARY OF VEGETATION TYPES

Vegetation Type	Acres				Total	Percent
	BLM	UDWR	State	Private	Acres	of Total
Agriculture	118	0	37	15,323	15,478	8.2
Barren	265	0	26	3	294	0.2
Montane/sub-alpine	161	23	61	134	379	0.2
Mountain shrub	38	182	102	111	433	0.2
Pinyon/juniper	20,302	2,433	5,112	5,320	33,167	17.6
Riparian/wetlands	590	64	197	4,358	5,209	2.8
Sagebrush/grass	43,331	8,399	15,281	12,408	79,419	42.2
Salt desert	17,472	0	14,305	18,480	50,257	26.7
Urban	95	0	14	3,484	3,593	1.9
Water	14	0	0	0	14	0.0
Total	82,386	11,101	35,135	59,621	188,243	100

TABLE 3.7-1

AREAS OF BIG GAME HABITAT TYPES[1] WITHIN THE PRICE COALBED METHANE PROJECT AREA

Species	Habitat Category	Acres of Habitat
Mule Deer	Critical Summer Habitat	1,285
	Critical Winter Habitat	53,870
	High Value Winter Habitat	51,809
	Limited Value Yearlong Habitat	77,005
	Total	183,969
Elk	Critical Summer Habitat	146
	Critical Yearlong Habitat	276
	Critical Winter Habitat	30,422
	High Value Winter Habitat	67,760
	Substantial Value Winter Habitat	33,804
	Limited Value Winter	13,781
	Total	146,189
Big Game	Mule Security Areas[2] Deer and Elk	14,820
	Total	14,820
Pronghorn Antelope	High Value Yearlong Habitat	49,142
	Potential Yearlong Habitat	28,913
	Total	78,055
Moose	Limited Value Winter Habitat	20,198
Black Bear	High Value Yearlong Habitat	26,578

[1]Habitat categories are defined according to the Utah Division of Wildlife Resources (UDWR 1995) as follows:

- Critical habitat - sensitive use areas that are of limited abundance and/or possess unique qualities, thereby constituting irreplaceable, critically necessary habitat.
- High priority habitat - intensive use areas that are highly important but relatively widely distributed.
- Substantial value habitat - areas used regularly but at moderate levels, and receiving little or no concentrated use.
- Limited value habitat - occasional use areas that are either sparsely populated or that show sporadic or unpredictable use.

[2]Security areas overlap with mule deer and elk critical and high value winter habitat.

TABLE 3.8-1

SPECIES OF CONCERN
IN CARBON AND EMERY COUNTIES

Species	Status[1] USDI	State
Bald eagle	endangered	endangered
Barneby reed mustard	endangered	
Big free-tailed bat	former C2	
Black-footed ferret	endangered	endangered
Bonytail chub	endangered	endangered
Burrowing owl	former C2	S1
Canyon sweetvetch	former C2	
Colorado squawfish	endangered	endangered
Creutzfeldt catseye	former C2	
Ferruginous hawk	former C2	threatened
Flannelmouth sucker	former C2	
Fringed myotis	former C2	
Graham beardtongue	C1	
Humpback chub	endangered	endangered
Jones cycladenia	threatened	
Last Chance townsendia	threatened	
Loggerhead shrike	former C2	S1
Long-eared myotis	former C2	
Long-legged myotis	former C2	
Maguire daisy	endangered	
Northern goshawk	former C2	S1
Pale Townsend's big-eared bat	former C2	S1S2
Peregrine falcon	endangered	endangered
Razorback sucker	endangered	endangered
Roundtail chub	former C2	threatened
San Rafael cactus	endangered	
Small-footed myotis	former C2	
Spotted bat	former C2	S1
Wright fishhook cactus	endangered	
Yuma myotis	former C2	

[1] Status categories for species of concern:

endangered = in danger of extinction throughout all or a significant portion of its range.
threatened = likely to become endangered within the foreseeable future.
C1 = considered for listing as threatened or endangered.
C2 = listing is considered possibly appropriate, but more information is needed to support listing.
S1 = declining in population, distribution, and/or habitat.
S2 = occurring in limited areas and/or numbers due to a restricted or specialized habitat.
S1S2 = both declining and limited in occurrence.

TABLE 3.10-1
AVERAGE DAILY TRAFFIC (ADT) IN THE PROJECT VICINITY

Highway	ADT 1985	ADT 1990	ADT 1994	Percent Change 1985 - 1994
U.S. Highway 6 West of Price	7,125	7,325	9,500	33%
U.S. Highway 6 West of Wellington	10,750	12,515	14,610	36%
State Route 10 South of Price	5,770	5,715	6,780	18%
State Route 10 at SR 155	3,760	4,795	5,055	34%
State Route 122 West of SR 10	1,250	1,165	1,370	10%

Source: Utah Departament of Transportation, Unpublished traffic data 1983-1994.

TABLE 3.11-1
SUMMARY OF BLM GRAZING ALLOTMENTS

Allotment Name	Acres		AUMs[1]	Acres per AUM	Livestock	Period	Management	Ecological Range Condition				
	Public	State/Private	on Public Lands	(Public Lands)	Type[2]	of Use	Category[3]	PNC[4]	Late Seral	Mid Seral	Early Seral	Unsuitable
Airport	655	0	20	33	C	4/16-5/31	C	--	178	231	246	--
Brown	162	38	15	11	C	5/1-5/31	C	16	32	114	--	--
Canyon	2,409	403	100	24	C	5/1-6/10	M	--	--	1,936	473	--
Consumers Wash	9,282	1,445	602	15	S	5/5-6/4	I	--	1,021	7,518	743	--
Fausett	144	1,140	16	9	S	11/1-5/31	C	--	63	75	6	--
Haley Canyon	3,497	25	154	23	C	5/16-6/30	I	--	1,469	1,923	105	--
						9/16-10/15						
Hayes Wash	6,135	3,528	342	18	S	10/15-5/31	M	--	1,396	3,405	1,334	--
Hiawatha	4,416	816	140	32	S,C	6/1-7/15	I	--	1,281	2,517	618	--
Long Bench	557	0	20	28	S	10/1-10/31	M	--	178	312	67	--
						6/1-6/30						
Marakis	116	84	16	7	S	6/1-6/30	C	--	110	6	--	--
						10/16-11/15						
Marsing	764	41	87	9	S,C	12/1-4/15	C	46	420	145	153	--
Mathis Wash	3,447	1,780	309	11	C	12/1-3/31	C	1,068	1,517	276	586	--
Miller Creek	6,922	1,572	634	11	C	12/1-6/10	C	--	831	5,330	761	--
Mohrland	3,456	331	112	31	C	4/1-6/15	M	--	56	3,264	136	--
North Spring	6,452	1,403	400	16	S	2/1-3/21	I	--	1,340	3,901	1,211	--
Oviatt	455	0	63	7	C	12/1-2/28	C	--	290	5	160	--
Peterson	134	0	1	134	C		C	--	9	34	91	--
Pinnacle Bench	2,002	82	259	8	C,S	4/20-5/19	I	--	501	901	600	--
						12/2-1/2						
Poison Springs Bench	10,934	1,157	930	12	S,C	4/20-6/1	I	--	1,859	6,342	2,734	--
						12/1-2/24						
						5/20-6/14						
Poryphyry Bench	4,856	3,790	290	17	S	10/20-12/1	I	--	1,117	2,962	777	--
						6/10-6/30						

TABLE 3.11-1
SUMMARY OF BLM GRAZING ALLOTMENTS

Allotment Name	Acres		AUMs[1]	Acres per AUM	Livestock	Period	Management	Ecological Range Condition				
	Public	State/Private	on Public Lands	(Public Lands)	Type[2]	of Use	Category[3]	PNC[4]	Late Seral	Mid Seral	Early Seral	Unsuitable
Spring Canyon	3,078	5,467	212	15	S,C	5/15-10/31	C	308	2,339	431	--	--
Staker	636	44	70	9	C	10/15-4/15	C	--	212	18	406	--
Trail Canyon	2,690	2,852	420	6	C,H	5/16-10/15	M	--	1,103	269	1,318	--
Washboard	8,767	2,373	358	25	C	4/16-5/31	I	446	1,423	3,712	3,186	--
Wattis	3,501	2,230	100	35	C	5/1-9/30	I	140	1,575	1,225	560	--
Wellington	662	1,232	48	14	C	5/1-5/20	C	--	--	662	--	--
Wood Hill	2,769	1,352	205	14	S	11/1-6/1	M	--	1,523	1,246	--	--
North Huntington	14,100	4,420	1,194	12	C	4/22-6/26 11/1-12/15	I	5,076	--	5,640	1,410	1,974
Total:	102,998	37,605	7,117					7,100	21,843	54,400	17,681	1,974

[1] AUM = Animal Unit Month

[2] C = Cattle; S = Sheep; H = Horse

[3] C = Custodial; I = Improve; M = Maintain

[4] PNC = Potential Natural Community

TABLE 3.14-1

TYPICAL VALUES[1] OF YEARLY DAY-NIGHT AVERAGE SOUND LEVELS FOR VARIOUS RESIDENTIAL NEIGHBORHOODS WHERE THERE IS NO WELL DEFINED SOURCE OF NOISE OTHER THAN USUAL TRANSPORTATION NOISE

Description	Population Density (people/sq. mi)	L_{dn}[2] dBA
Rural (undeveloped)	20	35
Rural (partially undeveloped)	60	40
Quiet Suburban	200	45
Normal Suburban	600	50
Urban	2,000	55
Noisy Urban	6,000	60
Very Noisy Urban	20,000	65

1 These values are logarithmic measurements (i.e., every 10 dBA increase in noise level is perceived by the human ear as approximately twice the noise level).

2 L_{dn} = average day-night sound level (refer to Section 3.14 for explanation)

Source: NAS 1977.

TABLE 3.14-2

NOISE BASELINE MONITORING RESULTS

	Distance from Source (feet)	Noise Level 15 min Leq (dBA)	Maximum Noise Level (dBA)[3]
Downwind of Drilling Activity	150	80.3	102.6
(Well # 2-48)	250	75.9	103.2
	350	70.6	93.5
	3300	45.1	60.2
Upwind of Drilling Activity	150	77.1	103.3
(Well # 2-48)	250	71.2	96.6
	350	69.2	96.4
Upwind of Drilling Activity (Well #-2-48) Without Blowdown[1]	150	70.9	---
Upwind of Drilling Activity (Well # 2-48) Blowdown Only[2]	150	85.8	102.5
Downwind of Well Workover	150	77.0	84.8
"FRAC" Job"	150	79.0	85.2
(Well #13-67)	150	70.4	78.4
	150	67.7	78.4
	250	64.6	70.4
RGC Office	90 ft from road	62.8	75.1
Closest Residence			
Daytime		44.1	66.2
Nighttime		27.8	44.2

[1] 10 min Leq (Leq = equivalent noise level)

[2] 1 min Leq

[3] Instantaneous maximum noise level during 15-min sample period

TABLE 3.15-1

HOUSING TYPES AND VACANCY RATES IN THE STUDY AREA

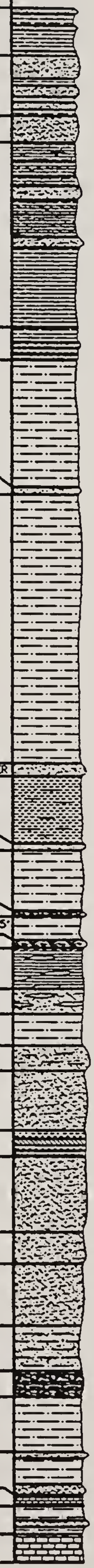
	Single Family Homes			Duplex, Fourplex			Apartments			Mobile Homes		
Carbon County	Total	Vacant	%	Total	Vacant	%	Total	Vacant	%	Total	Vacant	%
Price	2,500	97	3.90%	110	4	3.60%	375	15	4.00%	215	8	3.70%
Helper	920	45	4.90%	24	0	0.00%	30	2	6.70%	27	0	0.00%
Wellington	350	0	0.00%	13	0	0.00%	23	0	0.00%	130	0	0.00%
Unincorporated County	1,255	65	5.20%	25	1	4.00%	0	0	0.00%	710	37	5.20%
Total - Carbon County[1]	5,025	207	4.11%	172	5	2.90%	428	17	4.00%	1,082	45	4.20%
	Single Family Homes			Duplex, Fourplex			Apartments			Mobile Homes		
Emery County	Total	Vacant	%	Total	Vacant	%	Total	Vacant	%	Total	Vacant	%
Huntington	500	23	4.60%	56	2	3.60%	40	2	5.00%	225	9	4.00%
Castle Dale	380	18	4.70%	12	1	8.30%	1	0	0.00%	84	5	6.00%
Orangeville	400	10	2.50%	76	4	5.30%	0	0	0.00%	62	4	6.50%
Cleveland	108	7	6.50%	0	0	0.00%	0	0	0.00%	34	5	14.70%
Elmo	70	4	5.70%	4	0	0.00%	6	0		36	1	2.80%
Total - Emery County*	1,458	62	4.30%	148	7	4.70%	47	2	4.30%	441	24	5.40%

[1] County totals do not include communities outside of the study area

Source: Southeastern Utah Association of Local Governments 1995 and 1993

MINERALS[1]	GEOHYDROLOGIC UNIT[2]	DESCRIPTION[3]	THICKNESS[3]
		Variegated shales with subordinate sandstone, conglomerate and freshwater limestone, thickens to north, slope former.	500–2,500
	MESAVERDE AQUIFER	Gray to white gritty sandstone interbedded with subordinate shale and conglomerate, ledge and slope former.	600–1,000
	MESAVERDE AQUIFER	White to gray, coarse-grained often conglomeratic sandstone, cliff former, weathers to shades of brown.	150–1,000
COAL CBM	MESAVERDE AQUIFER	Yellow to gray, fine to medium-grained sandstone, interbedded with subordinate gray and carbonaceous shale, several thick coal seams.	700–1,000
	MESAVERDE AQUIFER	Yellow-gray, massive cliff-forming sandstone, often in several tongues separated by Masuk Shale, thickens westward.	90–1,000
	MANCOS CONFINING UNIT	Yellow to blue-gray sandy shale, slope former, thick in north and central plateau area, thins southward.	300–1,300
COAL?	MANCOS CONFINING UNIT	Yellow-gray friable sandstone tongue or tongues, cliff former, may contain coal.	50–800
	MANCOS CONFINING UNIT	Pale blue-gray, nodular and irregularly bedded marine mudstone and siltstone with several arenaceous beds, weathers into low rolling hills and badlands, thickens northerly.	780–1,110
	MANCOS CONFINING UNIT	Friable sandstone tongue or tongues, cliff former.	140–220
	MANCOS CONFINING UNIT	Same as BLUE GATE, above.	250–400
OIL, COAL, CNG, CBM	MANCOS CONFINING UNIT	Alternating yellow-gray sandstone, sandy shale and gray shale with important coal beds of Emery coal field, resistant cliff former.	50–950
OIL	MANCOS CONFINING UNIT	Blue-gray to black sandy marine slope forming mudstone.	400–650
OIL, CNG	DAKOTA AQUIFER	Variable assemblages of yellow-gray sandstone, conglomerate shale and coal. Beds lenticular and discontinuous.	0–60
	DAKOTA AQUIFER	Variocolored shale underlain by the Buckhorn conglomerate.	100–315
URANIUM	MORRISON CONFINING UNIT	Variegated-color claystone and mudstone, with a few thin limestone and sandstone lenses.	278
	?		
URANIUM	MORRISON AQUIFER	Light-gray, thin bedded friable quartzose sandstone with occasional interbeds of conglomerate and mudstone.	177
	CURTIS-STUMP	Reddish-brown shaley siltstone with thin, continuous bedding.	180–211
	CONFINING UNIT	Light-gray to greenish-gray, glauconitic quartzose sandstone with thin beds of conglomerate.	75–250
	ENTRADA SANDSTONE AQUIFER	Orangish-brown to light-brown, medium to thick bedded sandstone.	200–300
	CARMEL–TWIN CREEK CONFINING UNIT	Reddish-brown shaley siltstone underlain by light-gray, crystaline limestone.	280–350
CO_2	NAVAJO–NUGGET AQUIFER	Light brown to light gray, massive crossbedded, quartzose sandstone.	400–1,000
	NAVAJO–NUGGET AQUIFER	Lavender to reddish-brown, crossbedded, quartzose sandstone, well-cemented.	100–250
	NAVAJO–NUGGET AQUIFER	Reddish-brown to brown, quartzose sandstone, well-cemented by calcium.	350–450
	CHINLE–MOENKOPI CONFINING UNIT	Reddish-brown to dark brown sandstone and shaley siltstone.	150–175
	CHINLE–MOENKOPI CONFINING UNIT	Light-gray, crossbedded sandstone with interbeds of conglomeritic sandstone, conglomerate and mudstone.	70–175
CO_2, OIL	CHINLE–MOENKOPI CONFINING UNIT	Altered, greenish-gray, very fine grained, petroliferous sandstone and shaley siltstone.	575
	CHINLE–MOENKOPI CONFINING UNIT	Yellowish-gray to light brown, crystaline limestone.	40–150
	CHINLE–MOENKOPI CONFINING UNIT	Greenish-gray to yellowish-brown interbedded quartzose sandstones, shaley siltstones and mudstones.	150–200
CO_2, OIL		Light-brown limestone, contains chert geodes and fossils.	40–80

AGE	GROUP / FORMATION	STRATIGRAPHIC UNIT[3]
CRETACEOUS		LOWER NORTH HORN (CRETACEOUS)
CRETACEOUS	MESAVERDE GROUP	PRICE RIVER FORMATION
CRETACEOUS	MESAVERDE GROUP	CASTLEGATE SANDSTONE
CRETACEOUS	MESAVERDE GROUP	BLACK HAWK FORMATION OR GROUP
CRETACEOUS	MESAVERDE GROUP	STAR POINT SANDSTONE
CRETACEOUS	MANCOS SHALE	UPPER BLUE GATE MEMBER
CRETACEOUS	MANCOS SHALE	EMERY SANDSTONE MEMBER
CRETACEOUS	MANCOS SHALE	BLUE GATE MEMBER
CRETACEOUS	MANCOS SHALE	GARLEY CANYON SANDSTONE MEMBER
CRETACEOUS	MANCOS SHALE	BLUE GATE MEMBER
CRETACEOUS	MANCOS SHALE	FERRON SANDSTONE MEMBER
CRETACEOUS	MANCOS SHALE	TUNUNK SHALE MEMBER
CRETACEOUS	DAKOTA GROUP	DAKOTA SANDSTONE
CRETACEOUS	DAKOTA GROUP	CEDAR MOUNTAIN FORMATION 375'
CRETACEOUS	DAKOTA GROUP	BUCKHORN CONGLOMERATE
JURASSIC	MORRISON FORMATION	BRUSHY BASIN MEMBER
JURASSIC	MORRISON FORMATION	SALT WASH
JURASSIC	SAN RAFAEL GROUP	SUMMERVILLE FORMATION
JURASSIC	SAN RAFAEL GROUP	CURTIS FORMATION
JURASSIC	SAN RAFAEL GROUP	ENTRADA SANDSTONE
JURASSIC	SAN RAFAEL GROUP	CARMEL FORMATION
JURASSIC	GLEN CANYON GROUP	NAVAJO SANDSTONE
TRIASSIC	GLEN CANYON GROUP	KAYENTA FORMATION
TRIASSIC	GLEN CANYON GROUP	WINGATE SANDSTONE
TRIASSIC	CHINLE FORMATION	CHURCH ROCK MEMBER
TRIASSIC	CHINLE FORMATION	MOSS BACK MEMBER
TRIASSIC	MOENKOPI FORMATION	MOODY CANYON MEMBER
TRIASSIC	MOENKOPI FORMATION	TORREY MEMBER
TRIASSIC	MOENKOPI FORMATION	SINBAD LIMESTONE
TRIASSIC	MOENKOPI FORMATION	BLACK DRAGON MEMBER
		KAIBAB LIMESTONE



1. ASSOCIATED MINERALS OF ECONOMIC IMPORTANCE IN THE VICINITY OF THE PROJECT AREA: CBM—COALBED METHANE; CNG—CONVENTIONAL NATURAL GAS.
2. FROM FREETHEY AND CORDY, 1991.
3. MODIFIED FROM DOELLING, 1972; STOKES, 1988; CLARK, 1928.
4. MASUK SHALE CURRENTLY TERMED "UPPER PART OF THE BLUE GATE".

Job No. : 23578	FIG. 3.1–1
Prepared by : R.W.B.	PRICE COALBED METHANE EIS
Date : 1.31/96	TYPICAL STRATIGRAPHIC COLUMN

3578-TSC

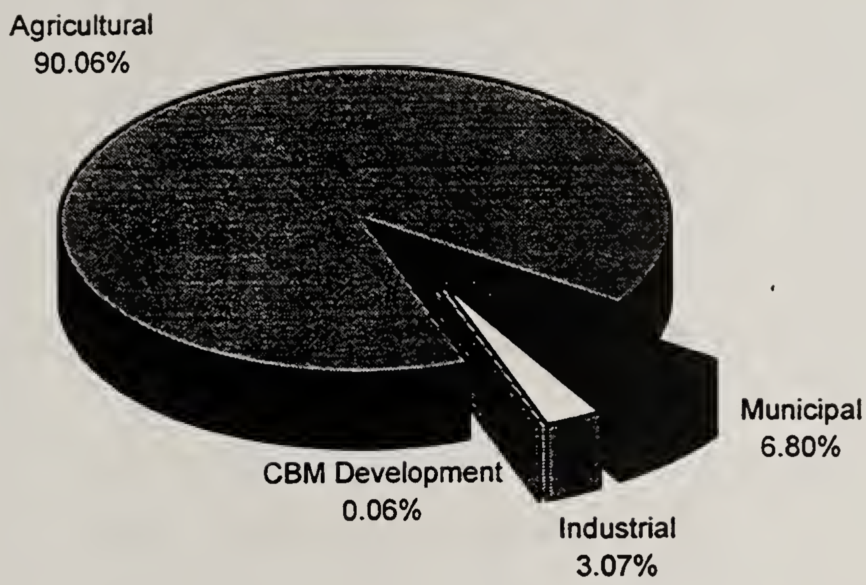


Figure 3.2-1(a) Comparison of CBM Water Needs vs 1995 Carbon County Uses

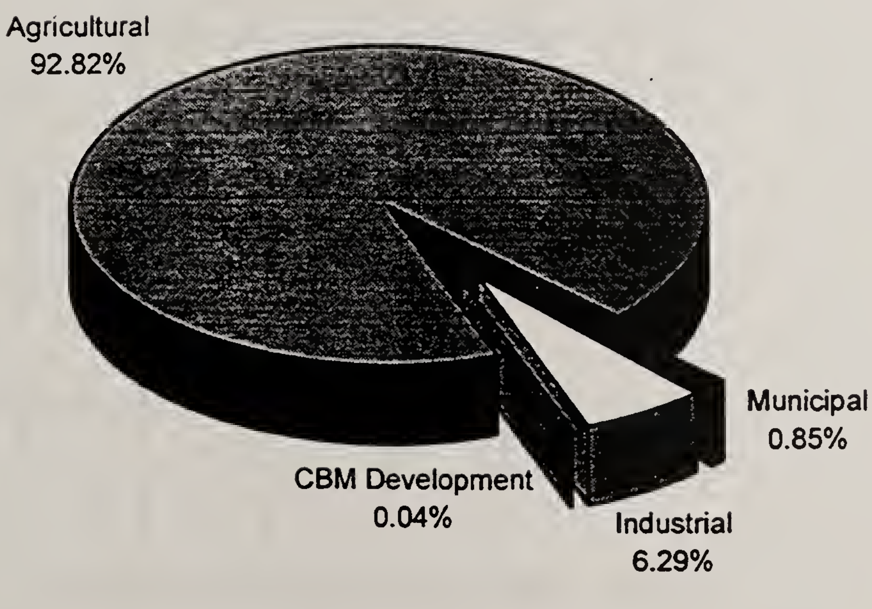


Figure 3.2-1(b) Comparison of CBM Water Needs vs 1995 Emery County Uses

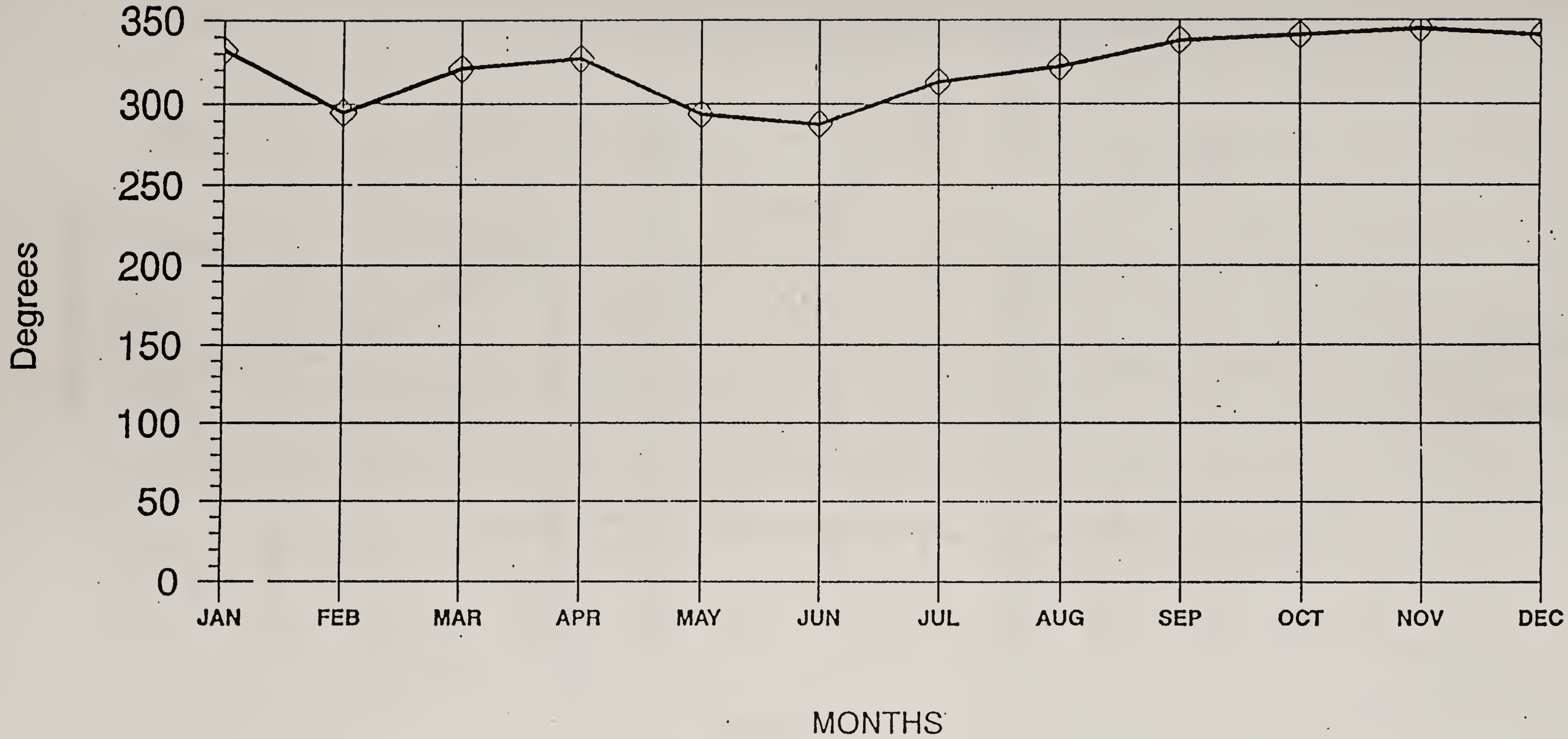


FIG. 3.3-1 Price Coalbed Methane EIS.
Monthly Average Wind Directions, Carbon County, Utah, 1990

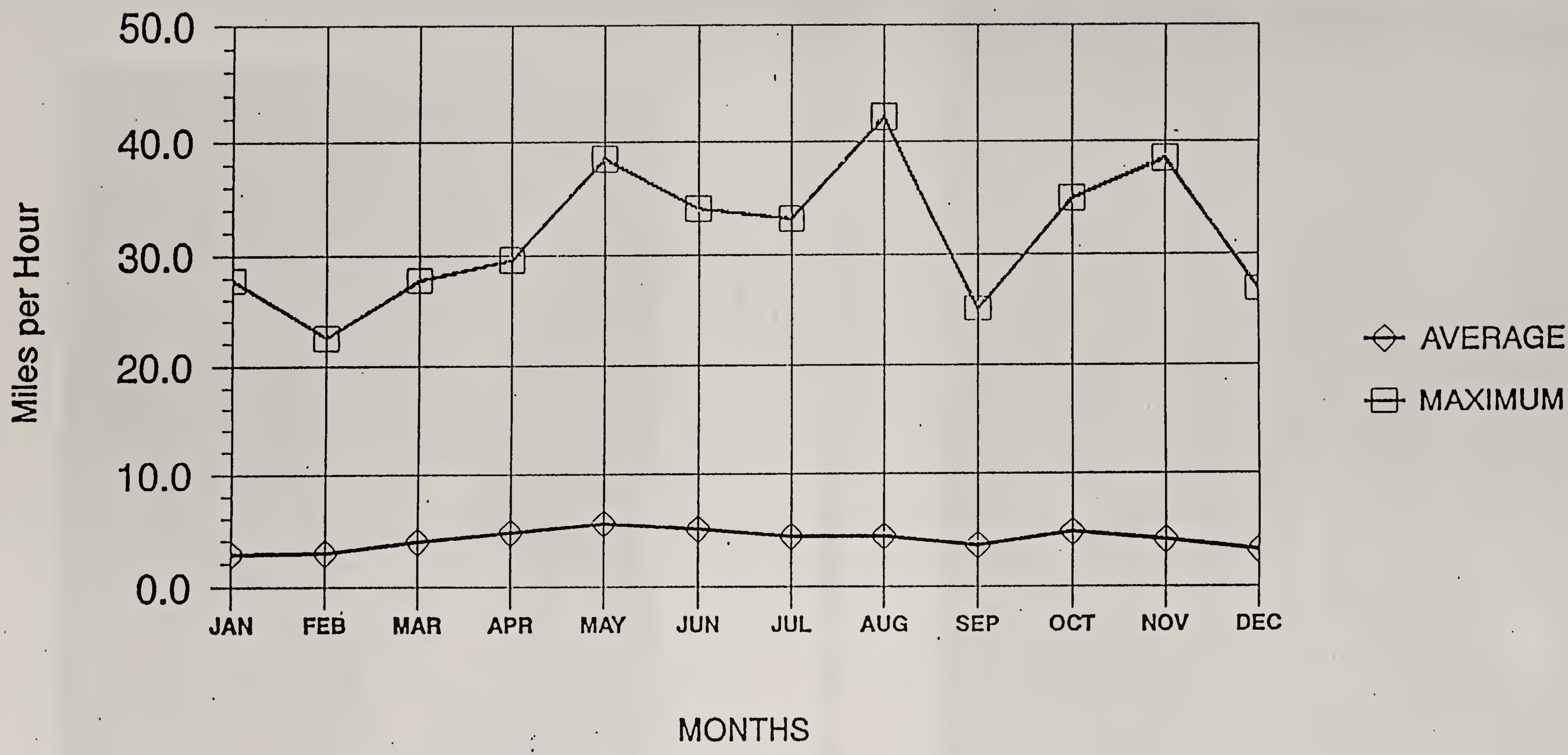


FIG. 3.3-2 Price Coalbed Methane EIS
Monthly Average and Maximum Wind Speeds,
Carbon County, Utah, 1990

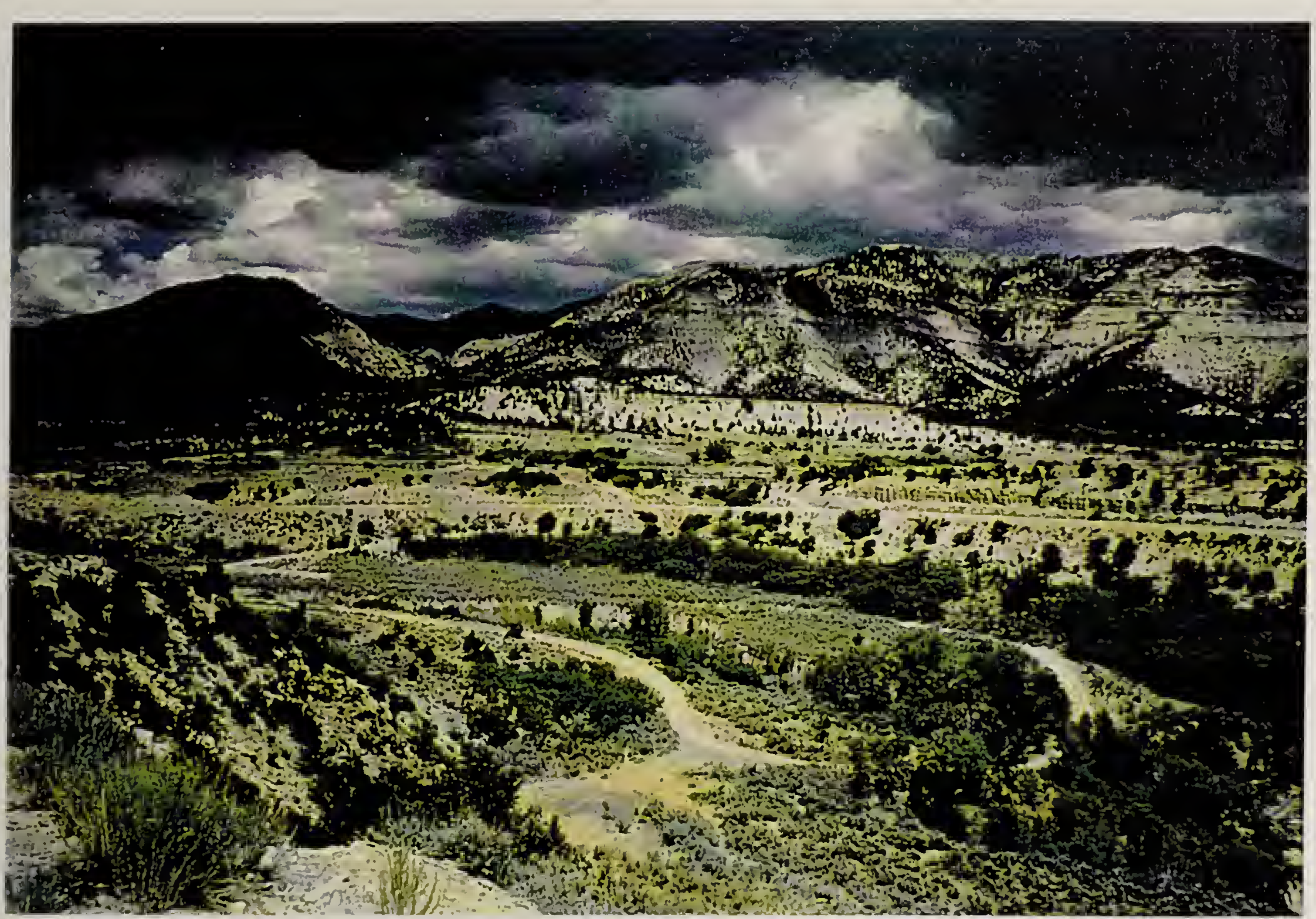
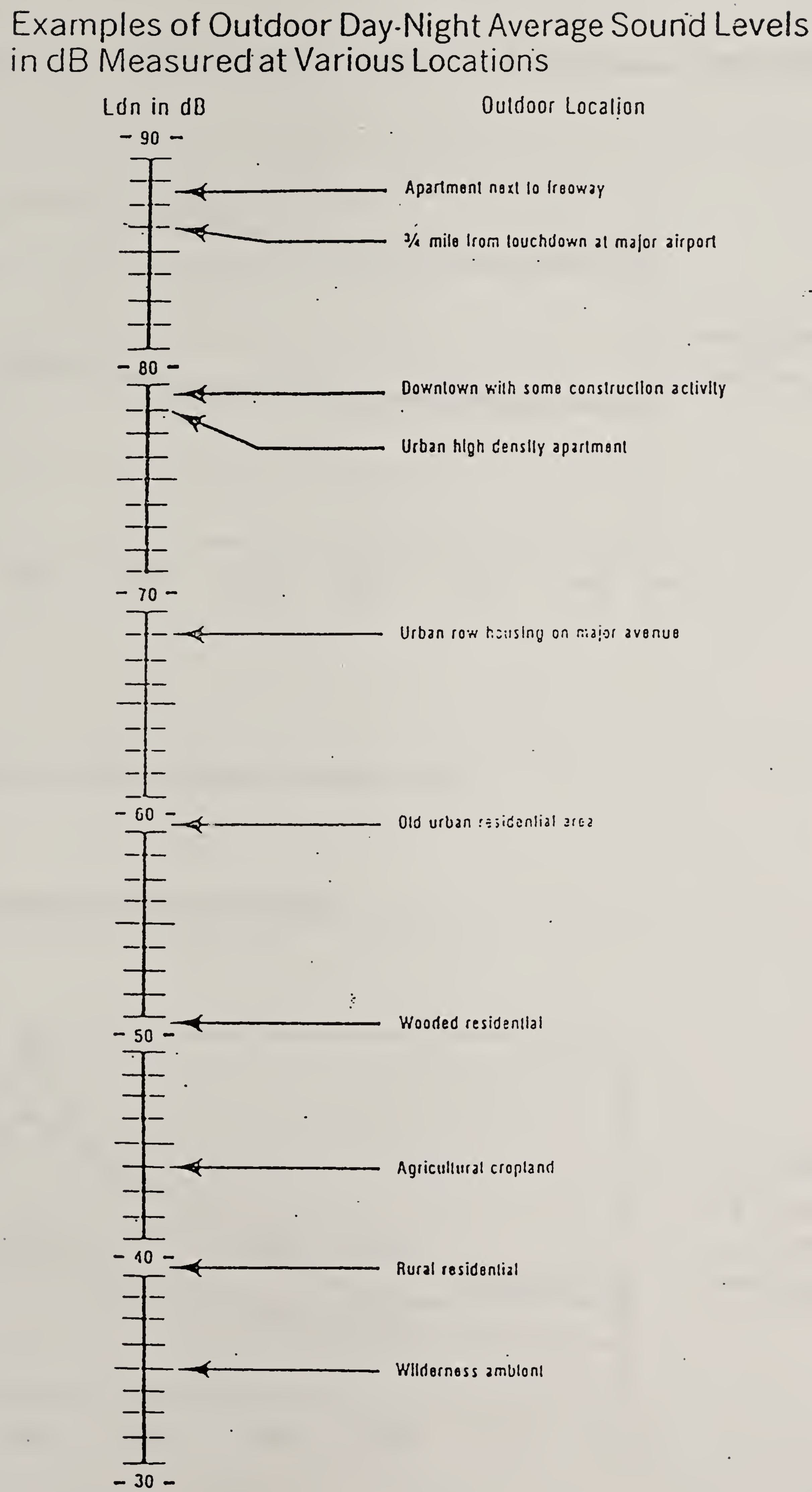


Figure 3.13-1(a) Gordon Creek Wildlife Management Area - Mixed Pinyon/Juniper VRM Class III Area

Figure 3.13-1(b) Rural Residential Area Along Gordon Creek Road - VRM Class II/III Area

Figure 3.13-1(c) Pinnacle Bench - Mixed Sagebrush/Grass VRM Class IV Area

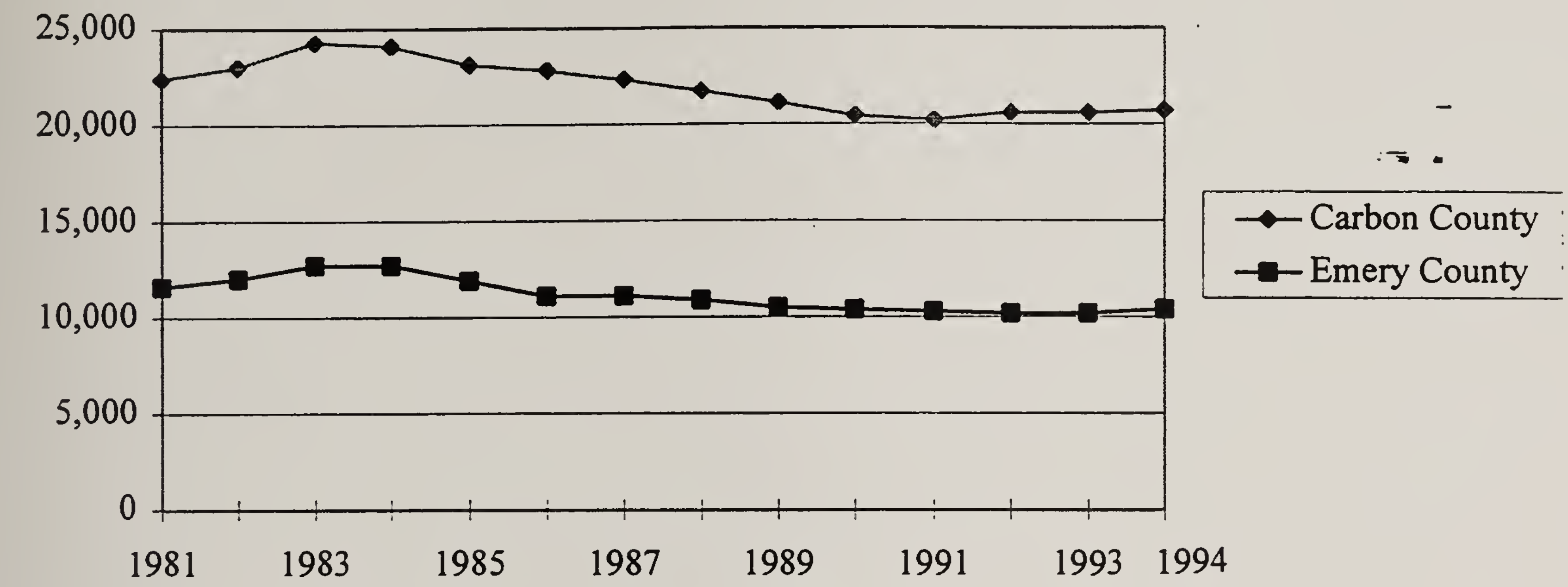
Figure 3.13-1(d) CBM Project Area in Salt Desert Vegetation - VRM Class IV Area



Source: U.S. Environmental Protection Agency, *Protective Noise Levels*, EPA 550/9-79-100, November 1978.

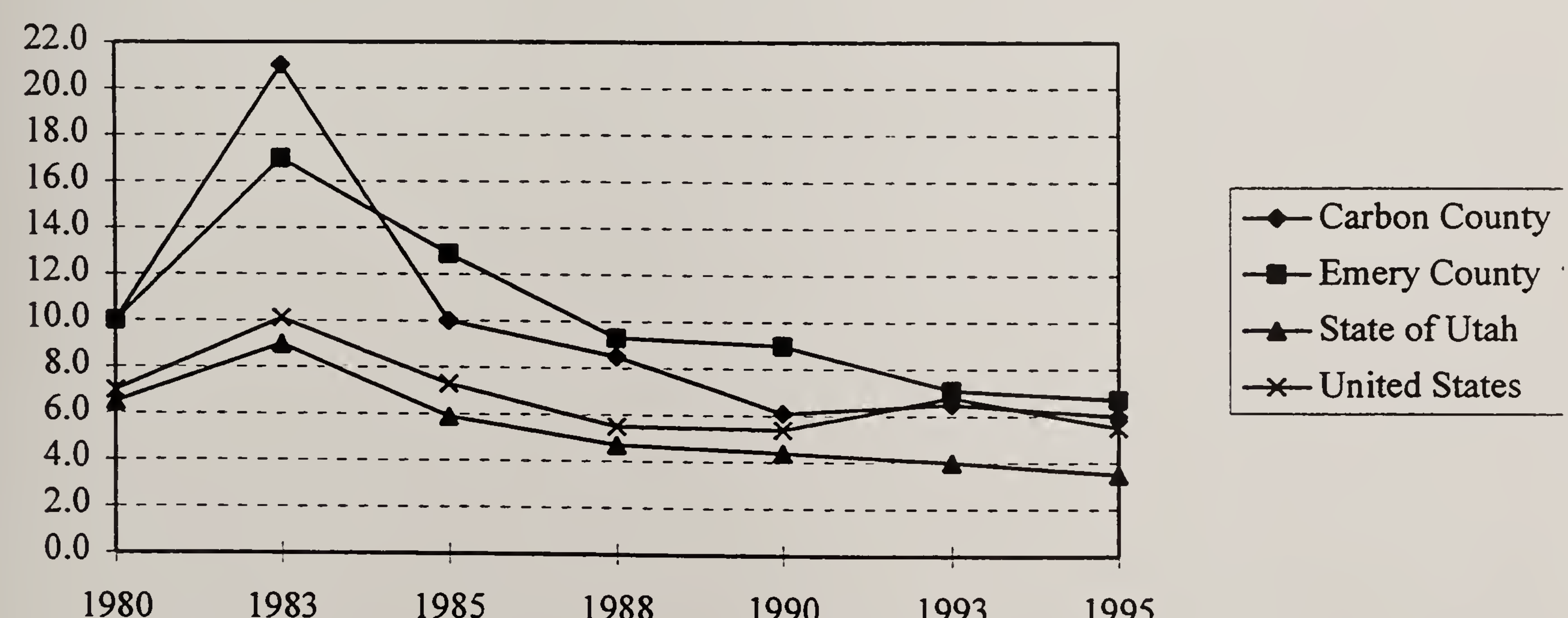
FIG. 3.14-1 Price Coalbed Methane EIS.
Average Sound Levels in dB Measured at Various Locations

Figure 3.15-1. Population Trends in Carbon and Emery Counties: 1980-1993



Source: Utah Governor's Office of Planning and Budget. 1994.

Figure 3.15-2. Unemployment Rates 1980-1995



Source: Utah Department of Employment Security, 1994.

Chapter 4.0

This section of the EIS provides an analysis of the impacts (environmental consequences) that would result from implementation of the proposed Price CBM project and alternatives. Certain measures that would avoid or reduce impacts have been included in the Proposed Action as discussed in Chapter 2 and the Standard Surface Use and Operating Plan, Appendix 2D. The following impact assessment takes these measures into consideration.

The impact analysis addresses all impacts that would occur in the Project Area, for all categories of land ownership. However, BLM's decision on this project will only apply to federal lands. The impacts reported for non-federal lands may occur regardless of BLM's decision, and are mostly the same among the different alternatives, except for differences relating to well spacing. Impacts on non-federal lands are included to provide a full disclosure of effects for the complete project, and to support other environmental revisions and permitting associated with the project.

The description of the environmental consequences for each resource in this section includes the following subsections:

Introduction - A description of the type and range of potential impacts that could occur as a result of implementation of the alternatives.

Direct and Indirect Impacts - An area-specific and site-specific impact assessment relative to the CBM gas production alternatives. This section quantifies and describes the impacts to the resource/ discipline.

Where applicable, impact significance criteria are described. These criteria represent the threshold or magnitude at which an impact would be considered significant, thus warranting special attention, such as special mitigation. These criteria are based on criteria from government regulatory standards, available scientific documentation, previously prepared environmental documents, and the professional judgment of resource specialists.

Impacts Summary - A comparison of direct and indirect impacts that would occur under each alternative and between alternatives. A summary comparison of alternatives is also provided in Table 2.7-2.

Mitigation - Additional measures that could be applied to avoid or reduce impacts, above and beyond the environmental protection measures described in Chapter 2. Mitigation specified in this summary are applicable to federal lands.

Unavoidable Adverse Impacts- Impacts that are unavoidable and cannot be mitigated.

Certain issues and environmental consequences were considered, but not analyzed in detail for each alternative. Refer to Section 1.6.2 for a discussion of these issues.

4.1 GEOLOGY

4.1.1 Introduction

The purpose of the Proposed Action is to remove all recoverable coalbed methane within a portion of the Project Area. The recovery of the methane is considered the only significant consequence to geologic resources. Other potential impacts, such as creating geologic hazards, precluding

development of other mineral resources, or disturbing paleontological resources, were considered, but not analyzed in detail by alternative. (Refer to Section 1.6.2.)

4.1.2 Direct and Indirect Impacts

4.1.2.1 Proposed Action

Under the Proposed Action, peak gas production is estimated to be 272 MMcf/day and total production for the first 15 years for the 601 new and 97 existing wells would be 863 bcf. This estimate is based on a zero-time plot analysis using production history from the existing RGC wells. CBM gas production should increase the first few years, then gradually decline. For purpose of analysis, it is assumed that annual production would be approximately 58 bcf. This represents approximately five times the volume of CBM produced in the state of Utah in 1995 which was 12.2 bcf (Petzet 1996). Annual CBM production in the U.S. in 1994 was 858 bcf (Stevens et al. 1996), approximately 15 times the production of the Proposed Action. However, CBM accounted for only five percent of U.S. natural gas production, and less than four percent of Utah's total gas production in 1994 (Petzet 1996).

This CBM production for the Proposed Action is an irretrievable commitment of resources as it will no longer be available for future use.

4.1.2.2 Alternatives A, B1, B2, C1, C2, and No Action

Production of CBM under all alternatives is an irretrievable commitment of the methane similar to the Proposed Action. The amount of gas produced will vary depending on the number of wells drilled in the field. The following is the anticipated gas production for the first 15 years for each alternative:

Alter-native	Total Production Wells	Peak Gas Production MMcf/day	Total Gas Production bcf
A	1,200	318	1,277
B1	533	230	675
B2	928	318	1,089
C1	647	260	806
C2	1,110	346	1,228
No Action	325	156	417

4.1.3 Impacts Summary

A summary comparison of impacts for each alternative is presented in Table 2.7-2. No adverse impacts to geologic resources are expected.

4.1.4 Mitigation

The BLM regulatory program, such as Onshore Oil and Gas Orders and Notices to Lessees ensures orderly and efficient gas production, and protection of the environment. No additional mitigation measures are required.

4.1.5 Unavoidable Adverse Impacts

No unavoidable adverse impacts are expected.

4.2 WATER RESOURCES

4.2.1 Introduction

Impacts to surface water quality may result from construction activities, accidental spills and crossing of streams by transportation corridors. Impacts to groundwater resources may result from withdrawing large quantities of water from the Ferron Sandstone and injecting this produced water into deeper formations (Curtis Formation, Navajo-Nugget

Aquifer and Entrada Aquifer). As the significant majority of the production waters would be injected into the Navajo-Nugget Aquifer, the following impact analysis focuses on that aquifer. Impacts to existing water uses may also occur as a result of the fresh water requirements of the Proposed Action. A summary of project features related to water resource impacts is provided in Table 4.2-1.

Project-wide environmental protection measures that would minimize impacts to surface and groundwater resources include: RGC 2, 3 and 7: BLM 1-5, 8-23, 29, 31-35, BLM 10 and BLM 18. Best Management Practices (BMPs) used to protect water quality and related aquatic habitat will comply with the State of Utah "nonpoint Source Management Plan for Hydrologic Modification" (Utah Department of Agriculture 1995).

For construction activities disturbing more than five acres, compliance with the Utah Pollutant Discharge Elimination System (UPDES) permit program will protect water resources from erosion and sedimentation and spills and leaks. A General Permit for stormwater discharges associated with construction activity would be obtained from the Utah Department of Environmental Quality. A stormwater pollution prevention plan would be developed identifying potential pollution sources and appropriate BMPs to reduce pollutants in stormwater runoff.

In addition, protection of water resources would be achieved through compliance with the Onshore Oil and Gas Order Nos. 1, 2, and 7 that specify surface and drilling requirements to provide safeguards and environmental protection of aquifers and surface waterbodies. A typical eight-point drilling plan for the proposed project, as required by Onshore Oil and Gas Order No. 1, is included in Appendix 2D.

Water resource issues that were considered, but not analyzed by alternative include the potential for community use of produced water, water rights owned by RGC, and the potential effect of CBM development on floodplains and springs. Refer to Section 1.6.2 for details.

4.2.2 Direct and Indirect Impacts

4.2.2.1 Proposed Action

Surface Water Quality

Surface water quality could be affected by general construction and reclamation activities as well as accidental spills and leaks. General construction activities involve the removal of vegetation, the exposure of soil surfaces and the compaction of soils. These disturbances which could potentially cause increases in runoff, erosion, and off site sedimentation would be minimized by the use of appropriate mitigation measures. Some sediments derived from the Mancos Shale and Mancos Shale derived soils, which are found over essentially the entire Project Area, may be very saline as discussed in Section 3.4.

The significance of any elevated TDS concentrations derived from these saline soils depends on the size of the disturbed area, salinity of the sediment involved, amount of runoff affected, proximity of the affected area to a body of water, and the effectiveness of erosion control measures. Places where transportation corridors or pipelines cross perennial streams would be the most susceptible to increased erosion and sedimentation.

Under the Proposed Action, approximately 4,095 acres would be disturbed. Approximately 2,353 acres would be disturbed over the long-term. The percentage of the Project Area that would be disturbed under the Proposed Action is only about 2.4 percent, including existing disturbance.

Locations close to springs and streams would be especially sensitive to construction activities and to accidental leaks and spills. Locations where transportation corridors cross streams, especially perennial streams, would also be more prone to problems associated with construction activities. There are currently two perennial streams that are crossed by project roads. Under the Proposed Action, there would be approximately 20 additional locations where transportation corridors cross perennial streams. Roads are proposed within the 660-foot buffer zone BLM5 for springs in 11 locations. Proposed wells would not be located within the buffer zone of either springs or the 100-year floodplain of perennial streams per BLM4.

BMPs to control erosion such as temporary ditches, water bars and detention basins would be implemented in compliance with the UPDES stormwater permit program and the Utah Nonpoint Source Management Plan (State of Utah 1995). Permanent stabilization controls for disturbed areas such as regrading and revegetation would be implemented in accordance with the BLM-approved reclamation plan.

As discussed in Section 4.4.1.1 and illustrated in Appendix 4A, ongoing soil loss in the Project Area under current conditions is estimated to range from 2 tons per acre per year on level areas with deeper soils to 12 tons per acre on steeper slopes. Post-reclamation soil loss calculated for the Proposed Action would be around 0.7 tons per acre per year or 1,235 tons per year. Assuming mulching of at least one-third of the disturbance area and successful revegetation in 5 years, the amount of salt that would be added to regional waters is estimated at 0.005 tons per acre per year or approximately 8 tons per year, well below natural rates. Although short-term increase in erosion and subsequently salt content would be expected despite the use of effective erosion control measures, longer-term erosion and salt loading conditions are expected to be within the range of rates reported for existing conditions. Based on the analysis discussed in Section 4.4.1.1 and illustrated in Appendix 4A, it is concluded that the salinity standard adopted by Colorado River Basin Salinity Control Forum would not be exceeded by the Proposed Action. Overall, no long-term adverse impacts to surface water quality due to erosion are anticipated. Please see Section 4.4.1.1 and Appendix 4A for a thorough discussion of the erosion potential soil loss and salt loading analysis.

Accidental leaks or spills of fluids or wastes such as produced water from conveyance pipelines; fuels, lubricants and solvents associated with machinery; or waste drilling fluids could adversely affect surface water quality. Areas that are particularly sensitive to accidental spills or leaks include springs, seeps and perennial streams. The significance of these potential impacts depends on the amount and nature of product spilled or leaked as well as the proximity of the spill to these sensitive areas. Locations where transportation corridors would cross perennial streams are the most significant concern.

RGC would implement a leak detection program for pipelines as described in the environmental protection measure RGC3, and

in accordance with Onshore Oil and Gas Order No. 7. There would be no above-ground tanks on the project site storing more than 1,320 gallons of petroleum products, therefore, no Spill Prevention, Control and Countermeasure (SPCC) plan would be needed. In the event of a minor accidental spill, the RGC personnel are trained to promptly contain and clean-up any released material. In addition, adherence to Onshore Oil and Gas Order No. 1 provides protection from accidental spills and leaks. Refer to Section 2.2.3.2 for a discussion of waste sources and controls.

Protection of surface water resources from accidental spills or leaks is largely reliant upon the successful implementation of the mitigation measures discussed above. As the type of activities that will occur does not vary between alternatives, the potential for adverse impacts to occur will only vary with the size of the project. It is anticipated that these measures can be implemented irrespective of which alternative is selected; therefore, no discussion of accidental spills or leaks is carried through the alternative discussions.

Water Resources of the Ferron Sandstone

As discussed in Section 2.2.3.2, and illustrated in Appendix 2E, peak water production of the entire field of 698 existing and proposed wells is estimated to be 107,000 BWPD (13.8 ac-ft/day). Water production of each well will decrease over time. Therefore, the analysis of impacts associated with peak production overestimates the potential magnitude of effect.

Injection of production water into a target zone with poorer quality than the produced water is consistent with BLM policy and the UDOGM UIC Permit Program. However, the disposal of produced water by injecting it into a deeper, poorer quality aquifer, or by evaporating it would result in the loss of the resource or at least the degradation of the resource. Once the produced water has been injected into the disposal reservoir, it would be more expensive to retrieve than it was when it was in the shallower Ferron Sandstone. It would also be more saline than it was in the Ferron Sandstone due to mixing with the poorer quality of the disposal reservoir.

Although the loss of water from the Ferron Sandstone does not constitute a significant impact due to it currently being uneconomical as a water source, the Proposed Action would result in the relocation and subsequent evaporation or degradation of up to 107,000 BWPD throughout the project life.

Consumptive use

Water Resources of the Navajo-Nugget Aquifer

The only activity that would disturb the Navajo-Nugget aquifer is the injection of water produced from the Ferron Sandstone into the Navajo-Nugget aquifer. Peak production of the Proposed Action of 698 wells is estimated to be 107,000 BWPD (13.8 ac-ft/day). Injection of production water would locally increase formation pressures and decrease salinity within the Navajo-Nugget aquifer. RGC currently disposes of production water in the American Quasar 31-1-D1 well with an approximate disposal capacity of 6,000 BWPD (0.8 ac-ft/day) based on existing injection rates. Seven new injection wells are proposed in addition to the existing permitted well. These eight wells give the operation a theoretical disposal capacity of 76,000 BWPD (9.8 ac-ft/day) assuming each new well can inject 10,000 BWPD (1.3 ac-ft/day).

Water quality in the Navajo-Nugget Aquifer is quite saline. Freethey and Cordy (1991) estimated that TDS concentrations ranged from 3,000 to more than 35,000 mg/L. TDS concentrations have been measured at 172,000 mg/L in the existing injection well and 121,000 mg/L in the recently drilled injection well, D-3. The injection of production water with TDS concentration less than 10,000 mg/L would thus not adversely impact the water quality of this aquifer.

Need to see param. used for calculation. And aquifer is not homogeneous

Analytical simulation of the injection of 10,000 BWPD per well entirely into the Navajo-Nugget aquifer using the Theis solution, for the complete 30 year project life, suggests that formation pressures in the immediate vicinity of the well may be increased by as much as 1,400 psi (equivalent to 3,225 feet of water). However, this excess pressure decreases to only 45 psi (104 feet of water) once approximately 2 miles away from any one injector. This evaluation is conservative as it assumes that this maximum flow rate will occur from day one until the end of the project. Actual water production is expected to increase incrementally for ten years, then drop off considerably, at which time individual injection rates could be decreased.

Needs map & more detail. Expand discussion

Known occurrences of fresh or potable water in the Navajo Sandstone include outcrop areas both west and east of the San Rafael Swell and in a broad area extending from the east-central edge of the Swell to the Green River. The distance from the southern most injector under the Proposed Action to the closest potable portion of the Navajo-Nugget aquifer is approximately 18 miles and the potentiometric surface in that area is estimated to be at least 100 feet higher than in the Project Area. In order for injected fluids to have any impact on the potable waters within the aquifer, the radius of influence would need to extend out as far as those areas and thus the potentiometric level would have to meet or exceed the level in those areas. Therefore there is little, if any, potential for the injection of production waters to increase the TDS concentrations of potable portions of the Navajo-Nugget aquifer.

Need better analysis

what about vert. leakage?

Water Use

The Proposed Action would require water for well drilling and stimulation; construction of roads, well pads, evaporation ponds and compressor stations; and preparing magnesium chloride solution for dust suppression. Table 2.2-4 shows the estimated water requirements for each alternative. Under the Proposed Action, a total of approximately 3,830,113 barrels (494 ac-ft) would be consumed over the life of the project. As discussed in Section 1.6.2, water purchased or leased by the project would not result in further depletion or adverse impact on the Price River or Scofield Reservoir. However, the 494 ac-ft of water would shift from municipal, industrial or agricultural use to the CBM Project. Refer to Section 4.8 for a discussion of potential impacts of water consumption on Colorado River fish.

4.2.2.2 Alternative A

Surface Water Quality

Disturbances that may affect surface water quality are the same for Alternative A as they were for the Proposed Action. The factors that affect the degree to which surface water quality may be affected are also the same. The size of the disturbed area under Alternative A is larger than that of the Proposed Action. Under Alternative A, approximately 5,758 acres would be disturbed for at least a short

period of time, and approximately 3,585 acres would be disturbed over the long-term. These areas represent about 3.3 percent and 2 percent of the total Project Area, respectively. There would be approximately 29 road crossings of perennial streams.

Erosion rates would be essentially the same for this alternative as for the Proposed Action as the same type of construction activities would occur. However, the amount of erosion and increased salinity would increase due to the larger area of disturbance under this alternative. Post-reclamation soils loss volumes calculated for Alternative A range from 1,540 to 36,414 tons per year with related salt loading estimates to surface water ranging from 11 to 255 tons per year for the Project Area. Thus, despite the increase in disturbance area and short-term sedimentation, longer-term erosion and salt loading conditions would be expected to remain within the range of rates reported for existing conditions. See Section 4.1.1.2 for a thorough discussion of erosion, soil loss and salt loading for Alternative A.

Water Resources of the Ferron Sandstone

Under Alternative A, the maximum total water production rate would be 130,500 BWPD (16.8 ac-ft/day). Although this is not considered a significant impact because the lost water resource is not considered economically useful at this time. Alternative A would result in the relocation and subsequent evaporation or degradation of up to 130,500 BWPD throughout the project life.

Water Resources of the Navajo-Nugget Aquifer

Conservative estimates of the maximum production rate, and therefore disposal rate, for Alternative A are 130,500 BWPD (16.8 ac-ft/day). In order to dispose of this production water, the number of injection wells and evaporation ponds would be increased by 1 (to 8) compared to the Proposed Action. The total anticipated disposal capacity from injection wells and associated evaporation ponds would be 141,000 BWPD which would exceed water production by approximately 10,000 BWPD. Although the volumes of water injected into the Navajo-Nugget Aquifer would increase by approximately 10,000 BWPD, little or no potential exists for injected waters to adversely impact potable portions of the aquifer under Alternative A.

what about leakage?

Water Use

Under Alternative A, a total of approximately 6,609,397 barrels (852 ac-ft) of water would be consumed over the life of the project, this is approximately twice the volume of water that would be required for the Proposed Action. As discussed in Section 1.6.2, water purchased or leased by the project would not result in further depletion or adverse impact on the Price River or Scofield Reservoir. However, approximately 852 ac-ft of water would shift from municipal, industrial or agricultural use to the CBM project.

4.2.2.3 Alternative B1

Surface Water Quality

The size of the disturbed area under Alternative B1 is larger than that of the Proposed Action. Under Alternative B1, a total of approximately 3,151 acres would be disturbed for at least a short period of time, and 1,818 acres would be disturbed over the long-term. These areas represent about 1.7 percent and 1 percent of the total Project Area, respectively. Under Alternative B1, there would be approximately 20 road

crossings of perennial streams. Proposed roads cross the 660-foot buffer zone of springs at 9 locations.

Erosion rates would be essentially the same for this alternative as for the Proposed Action as the same type of construction activities would occur. However, the amount of erosion would decrease due to the smaller area of disturbance under this alternative. The percentage of saline soils affected by this alternative are larger than the Proposed Action although the total number of acres affected would be less. Post-reclamation soil loss volumes calculated for Alternative B1 range from 994 to 22,346 tons per year with related salt loadings to surface water ranging from 7 to 167 tons per year for the Project Area. As erosion salinity loadings would be essentially the same for this alternative as the Proposed Action, remaining within the range of reported rates for existing conditions (see Section 4.4.3). Therefore, no long-term adverse impacts to surface water are anticipated for Alternative B1.

Water Resources of the Ferron Sandstone

The activities that could affect the water resources of the Ferron Sandstone are the same under Alternative B1 as they were under the Proposed Action. Under this alternative, the maximum water production rate for the project would be 86,500 BWPD (11.2 ac-ft/day). Although the loss of water from the Ferron Sandstone does not constitute a significant impact due to it currently being uneconomical as a water source, Alternative B1 would result in the relocation and subsequent evaporation or degradation of up to 86,500 BWPD throughout the project life.

Water Resources of the Navajo-Nugget Sandstone

Conservative estimates of the maximum production rate and therefore disposal rate, for Alternative B1 are 86,500 BWPD. Under Alternative B1, the number of injection well facilities and adjacent evaporation ponds would be reduced by two to five in comparison to the Proposed Action. The total anticipated disposal capacity would be 96,000 BWPD, which would exceed 9,500 BWPD. Little or no potential exists for injected waters to adversely impact potable portions of the aquifer.

Water Use

Estimated total water requirements for Alternative B1 is about 2,797,345 barrels (361 ac-ft) to install and stimulate each well and to construct the necessary roads, pipelines, etc. As discussed in Section 1.6.2, this would not result in further depletion or adverse impacts to water resources but would result in a change in water use.

4.2.2.4 Alternative B2

Surface Water Quality

The size of the disturbed area under Alternative B2 is larger than that of the Proposed Action. Under Alternative B2, a total of approximately 4,510 acres would be disturbed for at least a short period of time, and 2,775 acres would be disturbed over the long-term. These areas represent about 2.4 percent and 1.5 percent of the total Project Area, respectively.

Under Alternative B2, there would be approximately 26 road crossings of perennial streams. Proposed roads cross the 660-foot buffer zone for springs at approximately 13 locations. Due to the larger area of disturbance to highly erodable and/or saline soils, the amount of erosion and salt loading would be larger for this alternative than for the Proposed Action. Post-reclamation soil loss volumes calculated for Alternative B2 range from 1,229 to 29,084 tons per year with related salt loadings to surface water ranging from 10 to 229 tons per year for the Project Area. However, longer-term erosion and salt loading conditions are expected to remain within the range of reported rates for existing conditions (see Section 4.4.1.4). Therefore, no long-term adverse impacts to surface water resources are anticipated for Alternative B2.

Water Resources of the Ferron Sandstone

The activities that could affect the water resources of the Ferron Sandstone are the same under Alternative B2 as they were under the Proposed Action. Under this alternative, the maximum water production rate for the project would be 119,359 BWPD (15.4 ac-ft/day). Although the loss of water from the Ferron Sandstone would not constitute a significant impact, approximately 119,359 BWPD would be relocated and subsequently evaporated or degraded in quality.

Water Resources of the Navajo-Nugget Sandstone

The total disposal capacity would be the same as for the Proposed Action; that is 126,000 BWPD. Excess disposal capacity would total 6,641 BWPD. No adverse impacts are anticipated to the Navajo-Nugget Aquifer as a result of injection under Alternative B2.

Water Use

Estimated water requirements for Alternative B2 would be about 4,907,713 barrels (633 ac-ft) to install and stimulate all wells and to construct the necessary roads, pipelines etc. Impacts to existing water uses are basically the same as under the Proposed Action. As discussed in Section 1.6.2, this would not result in further depletion or adverse impacts to water resources but would result in a change in water use.

4.2.2.5 Alternative C1

Surface Water Quality

Approximately 3,778 acres would be temporarily disturbed, and 2,170 acres would be disturbed over the long-term of the project. This represents about 2 percent and 1 percent of the total Project Area, respectively. Under Alternative C1, there would be approximately 20 road crossings of perennial streams and 10 road crossings within the 660-foot buffer of springs.

The amount of erosion and salt loading for this alternative would be essentially the same as for the Proposed Action due to the similarity in acres and type of soil disturbance. Post-reclamation soil loss volumes calculated for Alternative C1 range from 1,139 to 26,956 tons per year with related salt loadings to surface water ranging from 8 to 189 tons per year for the Project Area (Section 4.4.1.5). As estimated rates remained within the range reported for existing conditions, no long-term adverse impacts to surface water resources are anticipated for Alternative C1.

Water Resources of the Ferron Sandstone

The activities that could affect the water resources of the Ferron Sandstone are the same under Alternative C1 as were under the Proposed Action. Under this alternative, the peak water production rate would be 96,250 BWPD (12.4 ac-ft/day). This is not considered a significant impact because the lost water resource is not economically useful at this time, although approximately 96,250 BWPD would be relocated and subsequently evaporated or degraded.

Water Resources of the Navajo-Nugget Sandstone

The total disposal capacity would be the same as the Proposed Action; that is 126,000 BWPD. Excess disposal capacity would total 29,750 BWPD. Therefore, little or no potential or adverse impacts to the Navajo-Nugget aquifer exists for Alternative C1 as for the Proposed Action.

Water Use

Estimated water requirements for Alternative C1 would be approximately 3,477,913 barrels (448 ac-ft) for construction activities, and well drilling and completion. As discussed in Section 1.6.2, this would not result in further depletion or adverse impacts to water resources but would result in a change in water use.

4.2.2.6 Alternative C2

Surface Water Quality

Approximately 5,318 acres would be temporarily disturbed, and 3,306 acres would be disturbed over the long-term of the project. This represents about 3 percent and 2 percent of the total Project Area, respectively. Under Alternative C2, there would be approximately 29 road crossings of perennial streams and 17 road crossings within the 660-foot buffer of springs. Post-reclamation soil loss volumes calculated for Alternative C2 range from 1,426 to 33,759 tons per year with related salt loadings to surface water ranging from 11 to 250 tons per year for the Project Area (Section 4.4.1.6). Due to the larger area of disturbance to highly erodable and/or saline soils, the amount of erosion and salt loading would be larger for this alternative than the Proposed Action. Therefore, longer-term erosion and salt loading conditions are expected to remain within the range reported for existing conditions. Therefore, no long-term adverse impacts to surface water resources are anticipated for Alternative C2.

Water Resources of the Ferron Sandstone

The activities that could affect the water resources of the Ferron Sandstone are the same under Alternative C2 as were under the Proposed Action. Under this alternative, the peak water production rate would be 129,500 BWPD (16.7 ac-ft/day). This is not considered a significant impact because the lost water resource is not economically useful at this time, although approximately 129,500 BWPD would be relocated and subsequently evaporated or degraded.

Water Resources of the Navajo-Nugget Sandstone

The total disposal capacity would be the same as the Proposed Action; that is 126,000 BWPD. Excess disposal capacity would total 11,500 BWPD. Little or no potential or adverse impacts to the Navajo-Nugget aquifer exist for Alternative C2 as for the Proposed Action.

Water Use

Estimated water requirements for Alternative C2 would be approximately 6,080,597 barrels (784 ac-ft) for construction activities, and well drilling and completion. This would not result in any further depletion or adverse impacts to water resources but would result in a change in water use.

4.2.2.7 No Action Alternative

Surface Water Quality

Under the No Action alternative, approximately 1,907 acres would be disturbed for at least a short period of time, and 1,050 acres would be disturbed over the long-term. These areas represent about 1 percent and 0.6 percent of the total Project Area, respectively. Under the No Action alternative, there would be approximately 18 road crossings of perennial streams. Proposed roads would cross the buffer zone of springs at 5 locations. Due to the significantly smaller area of disturbance to erodable and/or saline soils, the amount of erosion and salt loading would be lower for this alternative than the Proposed Action. Post-reclamation soil loss volumes calculated for the No Action alternative range from 607 to 14,361 tons per year with related salt loadings to surface water ranging from 5 to 107 tons per year for the Project Area (see Section 4.4.1.7). As longer-term erosion and salt loading conditions are expected to remain within the range reported for existing conditions, no long-term adverse impacts to surface water resources are anticipated for the No Action alternative.

Water Resources of the Ferron Sandstone

Under the No Action alternative, the maximum production water rate for the project will be 58,000 BWPD (7.4 ac-ft/day). This is not considered a significant impact because the lost water resource is not economically useful at this time, although approximately 58,000 BWPD would be relocated and subsequently degraded.

Water Resources of the Navajo-Nugget Sandstone

Four new injection wells are proposed in Section 2.2.3.2 in addition to the existing permitted well. These five wells give the operation a disposal capacity of 81,000 BWPD. Excess disposal capacity would total 23,000 BWPD. Little or no potential for adverse impacts to the Navajo-Nugget Aquifer exist for the No Action alternative.

Water Use

Estimated water requirements for the No Action alternative is about 1,532,861 barrels (198 ac-ft) for construction activities, and well drilling and completion. This would not result in any further depletion or adverse impacts to water resources but would change water use.

4.2.3 Impacts Summary

Potential impacts to water resources under the Proposed Action, Alternatives A, B1, B2, C1, and C2, and the No Action alternative are summarized in Table 2.7-2.

4.2.4 Mitigation

Compliance with the environmental protection measures identified in Section 2.2.5 will provide for adequate protection of the surface and subsurface resources. No additional mitigation measures are required.

4.2.5 Unavoidable Adverse Impacts

The primary unavoidable adverse impact to water resources is the consumptive use and degradation of the water resource within the Ferron Sandstone. However, due to the poor quality and currently prohibitive depth of the water this impact is not considered significant.

4.3 AIR QUALITY

4.3.1 Introduction

Air quality in the Project Area could be impacted as a result of project construction and operations in the following ways: (1) during construction by emissions from construction equipment and suspended particulate matter (dust) from roads, drilling sites, compressor sites, and general construction activities; (2) gaseous emissions from the operation of the gas fired compressors and glycol dehydration units at the compressor facilities; and (3) occasional flaring of gas at well sites. These impacts are discussed by alternative in this section. Impacts associated with venting of methane would not vary by alternative and are discussed in Chapter 1.

The Proposed Action and alternatives include several environmental protection measures as part of the project design. Specific to air quality, RGC-1 addresses dust suppression from construction and unpaved roads. RGC-3 consists of a leak detection program to detect leaks of methane from pipelines. These measures have been taken into consideration in this impact assessment.

Air quality impacts would be considered significant if the emissions from the proposed project would lead to predicted exceedances of the ambient air quality standards. These standards have been established to protect public health and welfare with an adequate margin of safety.

Impacts to visibility due to operation of the compressor stations considered both views from inside the nearest National Park (Capital Reef) and outside the park (so-called integral vistas). An integral vista is a view from a location inside the park of landscape features located outside the park boundaries. Impacts were estimated for two assumed plume viewing backgrounds: the horizon sky and a dark terrain object. Impacts were considered significant based on guidance provided by the EPA in the VISCREEN model user's guide. VISCREEN estimates impacts based on how clearly a plume could be seen, as measured in terms of both contrast and perception.

Although VISCREEN was developed primarily to assess impacts in Class I areas, the model was also used to estimate impacts in Price, Utah, because localized visibility impacts areas of concern.

4.3.2 Direct and Indirect Impacts

4.3.2.1 <u>Proposed Action</u>

<u>Impacts of Construction</u>

Construction activities would result in fugitive particulate emissions from construction activities and construction vehicle traffic. Additionally, gaseous pollutant emissions such as nitrogen oxides (NO_x), carbon monoxide (CO), and sulfur dioxide (SO_2) will result from operation of construction vehicles and drilling equipment.

The description of the Proposed Action (Chapter 2.0) includes estimates of the amount of equipment expected during construction of the proposed facilities. Because of the relatively small size of the

construction fleet and duration of construction at any one given site, the emissions from equipment engines are not expected to cause a violation of ambient air quality standards.

Earthwork during construction may contribute to emissions of particulate matter. The Environmental Protection Agency has estimated that such activity results in particulate emissions of 1.2 tons per acre per month (EPA 1985). However, environmental protection measure RGC-1 would reduce particulate emissions by 50 to 80 percent. As noted in Chapter 2.0, the amount of disturbance would be spread along the linear project facilities and at multiple sites. While particulate levels may be elevated for short periods of time at locations adjacent to the construction sites, these activities are not expected to result in a violation of the ambient air quality standards. Likewise, dust plumes during construction would be highly localized and would not be expected to have a significant impact on regional visibility.

Impacts of Operation

Each gas-fired compressor station would be required to apply for an "approval order" from the Utah Division of Air Quality prior to starting construction.

Air quality impacts from the operation of the gas-fired compressor stations and glycol dehydration units were evaluated using the Industrial Source Complex, Short-Term model, Version 3 (ISCST3). This model is approved by the EPA for the simulation of point and area sources in flat, intermediate and complex terrain. ISCST3 requires input variables that describe the source (its emission rates and release characteristics), the meteorological conditions that govern transport and dispersion and receptors (the location and elevation of points where concentration predictions are desired). The model has several options that affect the simulation. However, the EPA provides guidance on which options are to be used for regulatory applications. These regulatory default options were used for this modeling consistent with EPA guidelines.

The specific compressor engine drivers for the Proposed Action and alternatives have not been selected at this time. In order to provide input to the modeling, similar compressor station projects were reviewed to develop a typical natural gas-fired reciprocating engine. The nitrogen oxide emissions were assumed to reflect new engines with clean burn technology. An emission rate of 1.7 grams per horsepower-hour and an engine size of 1700 horsepower were assumed. The number of engines at each compressor station varied depending upon the total projected horsepower requirements. The compressor units were assumed to operate continuously throughout each day and year, at full horsepower. Data for the glycol dehydration units were taken from the compressor facility tables in Chapter 2 (Table 2.2-10 for the Proposed Action, and similar tables for the other alternatives).

In addition to the compressor engines and dehydrators, the Proposed Action includes the occasional flaring of gas. The number of wells to be flared is expected to be less than 10 and not all wells will be flared at the same time. Flaring at any given well may last for up to 90 days, but is more likely to last only 30 to 60 days. The volume of gas to be flared at each well is expected to be below 150,000 cubic feet per day, which represents a relatively small volume of gas. The EPA Compilation of Air Pollutant Emission Factors (Publication AP-42) states that newer, efficient flares are expected to have negligible nitrogen oxide

emission. Thus, flaring was not included in the model simulations.

For the purpose of the initial screening analysis, it was assumed that the proposed new compressor facilities would be either electrically-powered or fired on natural gas. Based on the number of compressors required and the horsepower requirements for each, it was assumed that reciprocating engines would be used for one-half of the total compression required while the remainder would be electrically powered. Use of only natural gas for compression would result in exceedance of air quality standards. Modeling results were compared to applicable NAAQS. The use of natural gas would result in only small emissions of particulate matter and sulfur dioxide, so no modeling of these compounds was performed. Similarly, small amounts of methane may be emitted from leaks. However, concentrations of methane are expected to be well below any explosive or toxic levels and leak detection programs are included as part of the project design.

Receptor Grid. A large grid of receptors was used to ensure adequate spatial coverage as well as provide for fine enough resolution to capture the expected point of maximum impact. A nested receptor grid was used which encompassed the Project Area and the compressor stations for the proposed project and alternatives. The receptor grid was approximately centered in the Project Area and a coarse grid having 1,000 meter (0.6 mile) spacing extended 45 kilometers (28 miles) in all directions. Fine receptor grids were then imbedded in the coarse grid around the areas of maximum impact to refine the prediction of maximum concentration. The fine grid extended 4 kilometers (2.5 miles) from its center and had a spacing of 100 meters (328 feet).

In addition to the locational coordinates of each receptor, the elevation of the receptor point was input. Receptor elevations were based on topographical maps. By entering receptor elevations, ISCST3 can simulate impact in flat, intermediate and complex terrain.

Meteorological Data. In order to simulate both short-term and annual average impacts, ISCST3 requires hourly values of temperature, wind speed, wind direction and atmospheric stability class. Monitoring stations in the general region were surveyed for the availability of such detailed data. One year of hourly data from the Utah Power and Light Clawson power plant was selected for the modeling. These data were collected in accordance with strict EPA quality control and assurance procedures required for PSD monitoring networks.

The meteorological data were collected during the year 1988. These data were reviewed to assess if this year was representative of typical climatological conditions expected in the Project Area. For example, if the distribution and frequency of occurrence of certain wind directions was significantly different than normal, the representatives of the modeling results could be affected. Based on this review, the 1988 data represent typical transport and dispersion conditions for the Project Area.

The modeling results were compared to the NAAQS for NO_2 and CO. Comparison to the NAAQS provides a method to ensure that the health based NAAQS will not be exceeded as a result of facility operation.

While the Proposed Action and alternatives are not expected to require PSD review, the model results indicate that PSD increments would not be exceeded. Detailed increment

consumption modeling will be performed as part of the State of Utah air quality permitting process.

Modeling Results

The estimated emissions from the proposed compressor stations were input to the model as described above. Table 4.3-1 presents the predicted concentration increases, compared to ambient standards and PSD increments. As can be seen, the operation of the project would not result in concentration increases above the PSD increments. Although increment consumption is determined on a point-by-point basis, Mr. Tom Orth of the State of Utah has stated that increment consumption in the Project Area is not an issue at this time. Mr. Orth ālso indicated that background NO_2 levels in the Project Area range from 5 to 17 $\mu g/m^3$. Adding these background levels to the predicted concentration increases indicates that no exceedance of the standard would occur.

Visibility impacts can include the impact of a visible plume from a single source or co-located group of sources (such as a compressor station), or from a general reduction in regional visibility because of the pollutant loading from multiple sources. The EPA has established screening procedures to address the issue of visible plumes using the VISCREEN model. However, the issue of regional visibility impacts are much more difficult to assess and there is not a generally accepted model to address this so called regional haze issue. In order to evaluate impacts from the Proposed Action and alternatives on regional visibility, comparisons were made between project emissions and the expected total pollutant loading in the Project Area. This approach assumes that regional visibility changes are directly proportional to emissions of certain pollutants. However, photochemical reactions and transport of pollutant in and out of the project region are not considered by such an approach.

The issue of a visual plume was addressed using the EPA VISCREEN model. VISCREEN assesses the likelihood of a visual plume being observed at a given location as well as when looking from a given location to a specific landmark.

The VISCREEN model was run to predict visibility impacts at Capitol Reef National Park, the closest national park and Class I area. This site is located 85 km (53 miles) from the nearest compressor station. The model was run for a point in the park closest to the compressor stations, and assumed all compressor units at full operation. Other stations would have lesser impacts. The VISCREEN modeling predicts that changes in contrast and perception would be below the EPA criteria and no visible plume would occur.

VISCREEN modeling predicts that an observer in Price, Utah, may see a visibile plume during worst-case conditions of a very stable atmosphere and low wind speed. The ability of an observer to perceive a plume would depend on the viewing angle. The occurrence of a visible plume would decrease or be eliminated under less stable or higher wind speed conditions.

While operation of the proposed compressor stations would not be expected to result in a significant impact at Capitol Reef National Park, the NO_x emissions from all of the natural gas-fired compressor units may contribute to regional haze and a reduction in overall visual range in the Project Area. However, based on the study results of the Mt.

Zirkel Wilderness Area Reasonable Attributions Study of Visibility Impairment, relatively uncontrolled emission sources such as automobiles and forest fires combined with the major coal-fired sources and smelters in the region have the greatest contribution to regional haze.

Operation of a typical natural gas-fired engine such as those proposed for this project would result in emissions of approximately 27 tons per year (0.07 tons per day) of NO_x. All of the compressor units combined would produce 0.9 to 2.4 tons per day of NO_x, depending on the alternative and assuming half are gas-fired. In comparison, a large power plant may emit over 100 tons per day of NO_x. Several coal-fired power plants exist in the project region as documented in the Grand Canyon visibility transport Commission Report (Dickson et al. 1995). The contribution of the compressor engines to the total NO_x loading is expected to be minor (less than one percent). Thus, while the Proposed Action may contribute to overall pollutant loadings and regional visibility reduction in the Project Area, the project impact would be expected to be minor.

The Proposed Action also includes the use of evaporation ponds with water sprays to treat produced water. During cold temperature, low windspeed periods, small amounts of airborne condensed water vapor may form at these ponds. However, because of the expected temperature of the produced water, any visible plume would be expected to have a small areal extent, and not have a significant impact to visibility.

4.3.2.2 Alternative A

Alternative A would involve development of project facilities using a well spacing of 80 acres. As a result of this alternative, the amount of surface disturbance would increase, thus increasing short-term construction emissions. However, no violations of the ambient air quality standards would be expected.

During operation, the number of compressor stations would be the same as for the Proposed Action; however, the number of engines would increase at some stations. Modeling predicts an increase of 22.5 $\mu g/m^3$ for NO_2. One-hour and eight-hour average CO levels are predicted to increase by 917 and 599 $\mu g/m^3$, respectively. While impacts would be somewhat greater than under the Proposed Action, no significant impacts are predicted. VISCREEN modeling predicts that no significant impacts would occur, similar to the Proposed Action.

4.3.2.3 Alternative B1

Alternative B1 would involve partial development of project facilities using a well spacing of 160 acres. As a result of this alternative, the amount of surface disturbance would decrease, thus decreasing short-term construction emissions. No violations of the ambient air quality standards would be expected.

During operation, the number of compressor stations would be the same as for the Proposed Action; however, the number of engines would decrease at some stations. Modeling predicts an increase of 5 $\mu g/m^3$ for NO_2. One-hour and eight-hour average CO levels are predicted to increase by 239 and 133 $\mu g/m^3$, respectively. Impacts would be less than under the Proposed Action and no significant impacts are predicted. VISCREEN modeling predicts that no significant impacts would occur, similar to the Proposed Action.

4.3.2.4 Alternative B2

Alternative B2 would involve partial development of project facilities using a well spacing of 80 acres. As a result of this alternative, the amount of surface disturbance would decrease, thus decreasing short-term construction emissions. No violations of the ambient air quality standards would be expected.

During operation, the number of compressor stations would be the same as for the Proposed Action; however, the number of engines would decrease at some stations. Modeling predicts an increase of 9 $\mu g/m^3$ for NO_2. One-hour and eight-hour average CO levels are predicted to increase by 349 and 228 $\mu g/m^3$, respectively. Impacts would be less than under the Proposed Action and no significant impacts are predicted. VISCREEN modeling predicts that no significant impacts would occur, similar to the Proposed Action.

4.3.2.5 Alternative C1

Alternative C1 would involve partial development of project facilities using a well spacing of 160 acres. As a result of this alternative, the amount of surface disturbance would decrease, thus decreasing short-term construction emissions. No violations of the ambient air quality standards would be expected.

During operation, the number of compressor stations would be the same as for the Proposed Action; however, the number of engines would decrease at some stations. Modeling predicts an increase of 8 $\mu g/m^3$ for NO_2. One-hour and eight-hour average CO levels are predicted to increase by 239 and 133 $\mu g/m^3$, respectively. Impacts would be less than under the Proposed Action and no significant impacts are predicted. VISCREEN modeling predicts that no significant impacts would occur, similar to the Proposed Action.

4.3.2.6 Alternative C2

Alternative C2 would involve partial development of project facilities using a well spacing of 80 acres. As a result of this alternative, the amount of surface disturbance would decrease, thus decreasing short-term construction emissions. No violations of the ambient air quality standards would be expected.

During operation, the number of compressor stations would be the same as for the Proposed Action; however, the number of engines would decrease at some stations. Modeling predicts an increase of 19 $\mu g/m^3$ for NO_2. One-hour and eight-hour average CO levels are predicted to increase by 769 and 484 $\mu g/m^3$, respectively. Impacts would be less than under the Proposed Action and no significant impacts are predicted. VISCREEN modeling predicts that no significant impacts would occur, similar to the Proposed Action.

4.3.2.7 No Action Alternative

The No Action alternative would involve development on only state and private land. As a result the amount of surface disturbance would decrease, thus decreasing short-term construction emissions. No significant impacts would be expected.

During operation, the number of compressor engines at the stations would decrease.

Modeling predicts a maximum increase of 10 $\mu g/m^3$ for NO_2. One and eight hour CO levels are predicted to increase by 432 and 282 $\mu g/m^3$, respectively. Impacts would be less than under the proposed action and no significant impacts are predicted. VISCREEN

modeling predicts that no significant impacts would occur, similar to the proposed action.

4.3.3 Impacts Summary

A summary comparison of impacts for each alternative is provided in Table 2.7-2. Construction activities would result in the short-term increase of particulate matter concentrations in the immediate vicinity of the work. However, no significant impacts are anticipated for any of the alternatives. During operation, the use of electrified drivers for one-half of the compression horsepower would result in emission levels that would not lead to significant impacts to either air quality or visibility. Under worst-case conditions, a plume from the nearest compressor station may be visible from Price, Utah, but plumes would not be visible from Capitol Reef National Park. The nitrogen emissions from the compressor stations would contribute to regional haze, but project emissions are small compared to regional sources.

4.3.4 Mitigation

Additional measures that can be undertaken to mitigate impacts include the following:

- Follow manufacturers' specifications for the operation and maintenance of all facilities and vehicles to reduce emissions.
- Careful selection of the compressor units to minimize potential emissions of NO_x and CO at the new facilities.

Use a combination of gas fired and electric powered compressors to minimize air quality impacts.

4.3.5 Unavoidable Adverse Impacts

The Proposed Action and each of the alternatives would lead to short-term increases of particulate matter and gaseous pollutants during construction. These emissions would temporarily elevate pollutant concentrations in the immediate vicinity of the construction activities. During operation, natural gas-fired compressor engineer emissions of NO_x and CO would increase ambient concentrations in the project region.

4.4 SOILS

4.4.1 Introduction

Impacts to soils from the construction of CBM well pads, access roads, compressor facilities, injection wells, installation of gas and water pipelines, and installation of electrical power lines include:

- Increased exposure of surface soil materials to accelerated erosion and loss of soils resources.
- Increased sediment loads of stream channels and rivers, particularly increased salinity of surface water as a result of erosion of high to very highly saline soils.
- Increased volumes of surface runoff resulting in new gully development.
- Soil compaction and rutting from heavy equipment traffic.
- Reduced soil productivity as a result of decreased biological activity and reduced organic matter content of surface soils.

- Loss of soil profile development due to mixing of soil horizons and breakdown of soil structure.

Such adverse impacts would result from the clearing of vegetation, excavation, salvage, stockpiling, and redistribution of soils during construction and reclamation activities. Blading or excavation to achieve desired grades could result in slope steepening of exposed soils in cut and fill areas, mixing of topsoil and subsoil materials, and the breakdown of soil aggregates into loose particles. Soil structural aggregates would also be broken down by compaction from vehicular traffic.

The absence of vegetative cover, steepening of slopes, and the breakdown of aggregates would increase the potential for channelized runoff and accelerated soil erosion. Erosion would result in the formation of more rills and gullies and increased sedimentation and salinity of surface water. The end result of these impacts would be increased difficulty in achieving successful reclamation. A combination of these impacts with sensitive soils could result in the failure of reclamation efforts.

In addition, erosion and sedimentation of highly saline soils could increase salinity of the Price River and ultimately the Colorado River (Section 4.2).

__Significance Criteria__

The following criteria were used to determine the significance of impacts to soils within the analysis area:

- Increased soil erosion that cannot be reduced by 50 percent after one year and by 75 percent after five years of soil disturbance.
- Excessive rill and gully development.
- Sedimentation and salt delivery rates in excess of natural rates of 0.005 to 0.51 tons per acre per year (USDI, BLM 1988; Riley et al. 1982).
- Location and construction of project facilities on sensitive soils (soils having one or more of the following characteristics; high erosion potential, high salinity, and unsuitable reclamation material) without the use of special construction methods.
- A reduction in soil productivity to a level that minimizes or prevents the disturbed area from recovering to pre-disturbance soil productivity levels.

Implementation of the environmental protection measures discussed in Section 2.2.5 would reduce impacts to soils. Specific measures applicable to soils include:

- RGC-6 states that RGC would promptly reclaim all disturbed areas not needed for the life of the project.
- BLM 1 - BLM 23 and Appendix 2D (BLM SUPO) limit construction in sensitive areas, and provide for a general reclamation plan with erosion control measures and revegetation requirements.
- Site-specific measures would be developed with each agency and private landowner prior to project development.

Measures presented or referenced in Section 2.2.5 are predominantly standard protection measures that have been recommended and implemented by industry

and agencies (USDI, BLM 1992a, USDI, BLM and USDA, FS 1989, Law 1984, USDA, FS 1979).

The impact analysis for each alternative will focus on the following sensitivity units:

- Soils with a high erosion potential, as determined by the NRCS (USDA, SCS 1970 and 1988);
- Soils with salinity levels greater than 8 mmhos/cm;
- Soils unsuitable for use as reclamation material such as gullied lands, rock outcrops, and barren shale;
- Soils with a high erosion potential in combination with highly saline soils or soils unsuitable for reclamation material.

4.4.2 Direct and Indirect Impacts

4.4.2.1 Proposed Action

Table 4.4-1 summarizes acres of impacts to sensitive soils on federal, UDWR, state, and private land, with a breakdown of short- and long-term impacts.

Direct, short-term impacts under the Proposed Action would involve the disturbance of approximately 4,095 acres of soils; 2,211 acres of federal lands, 334 acres of UDWR lands, 616 acres of state lands, and 934 acres of private lands.

Short-term impacts associated with construction activities include temporary disturbance of soils for installation of pipelines and electrical transmission lines, and construction of a road network to access all wells. Immediately following installation of the pipelines, soil would be backfilled into the trenches and regraded as necessary. Portions of the construction ROW not to be retained as part of the adjacent road would be promptly reclaimed and revegetated to reduce impacts and return these areas to productive use. Short-term impacts would affect 2,512 acres of sensitive soils.

Long-term impacts would include the disturbance of soils for development of facilities such as production wells, compressor sites, injection wells, evaporation ponds, and access roads needed for the life of the project. Reclamation and revegetation of these areas would not occur until the project is completed. Long-term impacts would affect 1,523 acres of sensitive soils (Table 4.4-1).

Sensitive soils would be avoided where possible during project construction; however, approximately 61 percent of soils disturbed under the Proposed Action fall within one or more of the sensitive soil categories described above. This includes:

- 1,125 acres of soils with a high erosion potential
- 1,236 acres of highly saline soils
- 151 acres of soils unsuitable for use as reclamation material

The 2,512 acres of sensitive soils that would be impacted under the Proposed Action include 527 acres of soils with a combination of high erosion potential and high salinity characteristics, and 116 acres of soils with a combination of high erosion potential and soils unsuitable for reclamation material (Plate 15). None of the soils have a combination of all three of the sensitivity criteria.

Erosion

Approximately 27 percent of the total disturbance area has soils with a high potential for erosion. Trenching activities for pipeline installation would result in the removal of vegetation, mixing of soil horizons, and increased susceptibility to erosion in newly disturbed areas. Soil compaction caused by equipment traffic may decrease infiltration and water storage capacity, increase runoff, and reduce soil productivity.

Following successful reclamation of pipeline ROWs, approximately 669 acres of soils with a high potential for erosion would be impacted for the long-term. Construction of facilities would include the removal of vegetation and excavation and stockpiling of soil material. These activities would result in increased soil exposure, mixing of soil horizons, soil compaction, loss of topsoil productivity, and increased susceptibility of the soil to wind and water erosion. These impacts would, in turn, lead to increased runoff, soil loss, and off-site sedimentation. Additionally, rill and gully development could be expected where surface water runoff would be channelized such as in ditches along roads or around well pads, and where culverts or water bars would discharge excess water. The potential for gully development would increase with increasing slope steepness.

Soils throughout the Project Area, when disturbed, are naturally highly erodible and complete avoidance of these sensitive areas would not be possible (Plate 12). Soil loss tolerance factors for the Project Area range from 1 to 5 tons per acre per year. That is, the maximum rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period is one ton per acre per year for the most sensitive soils.

Under a combination of natural and past and current management conditions (federal, state, and private), the soil has already eroded away in a number of areas within the Project Area leaving badlands and gullied lands. The soil map units Unsuitable Reclamation Material and Poor Quality Reclamation Material - Gullied Lands of Plate 14 define the approximate locations and extent of lands where the soil layers have been removed by mostly water erosion. The amount of ongoing soil loss in the Project Area under current conditions ranges from approximately 2 tons per acre per year on level, deeper soils to 12 tons per acre per year on steeper slopes with sparse vegetation (Cook and Sasser 1996).

Estimated soil loss, sedimentation, and salt delivery rates were calculated using the Revised Universal Soil Loss Equation (RUSLE). The methodology and calculations are in Appendix 4A. For comparison, soil loss was calculated for bare ground conditions representing no mitigation; mulched ground representing early reclamation; and 5-year reclamation representing successful revegetation. Without mitigation, erosion rates could be as high as 16.8 tons per acre per year, which would amount to about 29,230 tons of soil loss per year under the Proposed Action (Appendix 4A, Table 4A-1).

The rigorous application of erosion control measures including the use of mulch or jute netting as temporary erosion control, and construction of water bars as discussed in Section 2.2.5 would reduce the potential for soil erosion. Assuming one-third of the Project Area would be mulched (Jensen 1996), erosion rates would be reduced by about 86 percent, or 2.4 tons per acre per year.

Soil loss would be about 1,647 tons per year (Appendix 4A, Table 4A-1). This would reduce erosion well below current rates in areas already experiencing high rates of erosion.

Assuming revegetation efforts are successful within 5 years, erosion rates would be reduced by 96 percent. Soil loss would be 0.7 tons per acre per year or 1,235 tons per year under the Proposed Action (Appendix 4A, Table 4A-1).

In areas not currently undergoing accelerated erosion, the construction of facilities (roads, well pads, and structures) would increase the potential for increased surface runoff due to a precipitation event within an affected watershed. Runoff from these facilities, particularly the roads, would likely be quickly focused into channels by constructed retention and conveyance features such as water bars, roadside ditches, and culverts. It is this additional channeled runoff that would add to the area's already accelerated channel erosion (gullies and increasingly incised drainages) down stream in a number of the local watersheds and potentially induce an expansion of gullies or stream incision to previously unaffected parts of the watersheds.

However, implementation of environmental protection measures outlined in Section 2.2.5 and measures mandated in the SUPO presented as Appendix 2D would limit the increase of channeled flows and soil loss to a brief period of construction. The construction and maintenance of berms around well and facility pads, water bars, retention and conveyance ditches, ditch gradient controls (check dams), culverts, and water energy and dispersion features would effectively control additional accelerated erosion produced by well field development. Diversion or dispersion of channelized water to less sensitive areas along with vigilant monitoring would reduce potential impacts, particularly impacts severe enough to prevent access to valleys and ranges in the Mancos shale region of the Project Area.

These measures could also potentially contribute to a reduction in existing erosion rates in high erosion areas by intercepting flows, reducing their energy, and promoting dispersal and infiltration. The effectiveness in the mitigation of existing high erosion conditions would be governed by characteristics of the watershed and the frequency and magnitude of precipitation events.

Without additional mitigation measures to prevent rill and gully development, significant localized impacts could be anticipated.

Salinity

About 30 percent of the soils disturbed under the Proposed Action are highly to very highly saline. Following successful reclamation of the pipeline ROWs, impacts would affect 766 acres of highly saline soils for the long-term. Saline soils are abundant throughout the eastern half of the Project Area and are present in scattered segments throughout the western half and, therefore, cannot be entirely avoided (Plate 13). Soils developing in Mancos Shale materials have been reported to have 1.46 to 3.8 percent salt (USDI, BLM 1988c).

As water erosion and sedimentation of saline soils is the primary mechanism by which salts are introduced to the surface water drainage system, the absence of soil erosion controls, particularly in source areas for salts, would enhance conditions for salt introduction to surface waters. From here it would be carried by surface run-off into local creeks, streams,

and rivers and ultimately into the Colorado River. The majority of sediment delivery originates from erosion and degradation of stream channels as opposed to soil erosion away from channels.

Assuming the current rate of soil loss is 2 to 12 tons per acre per year, and using the same methodology shown in Appendix 4A and the San Rafael study (USDI, BLM 1988), natural salt loading rates would range between 0.005 to 0.22 tons per acre per year. Another study done by Riley et al. (1982) to evaluate salt movement from the Price River Basin to the Colorado River system concluded that natural salt loading rates range from 0.08 tons per acre per year from the valley floor to 0.51 tons per acre per year in the mountains; agricultural loading rates amount to 2.81 tons per acre annually. According to the study results, 38 percent of the total salt loading is attributable to irrigated agricultural lands; 60 percent from the mountainous areas, and 2 percent from nearly level to gently sloping non-irrigated lands.

Under the Proposed Action, salt delivery rates for bare ground conditions would average 0.1 ton per acre per year. About 194 tons of salt per year would enter the Colorado River system as a result of project development and construction. Mulching at least one-third of the disturbance area would reduce salt loading by 80 percent. Salt delivery would be about 0.02 tons per acre per year, or about 27 tons per year. Assuming successful revegetation in 5 years, salt delivery would be further reduced by 95 percent to 0.005 tons per acre per year. This would amount to 8 tons of salt per year added to the regional water system (Appendix 4A, Table 4A-1).

The significant reduction of salt loading rates assumes the rigorous application of environmental protection measures to control erosion. Measures such as slope reduction, the use of water bars, mulch or netting, and the avoidance of the steepest slopes all serve to reduce erosion and, therefore, sedimentation and salt delivery. It also assumes that all revegetation efforts are successful. In reality, salt delivery rates will likely be somewhere between 0.005 and 0.1 tons per acre per year. These rates fall within the natural rates presented above.

Soils Unsuitable for Use as Reclamation Material

Soils considered unsuitable for reclamation material comprise about four percent of soils that would be impacted by development of the Proposed Action. Following successful reclamation of the pipeline ROWs, 88 acres of soils unsuitable for reclamation material would be affected for the long-term.

These soils occur throughout the Project Area, particularly the riverwash material along the Price River, and badlands and rock outcrops located in the southeastern part of the Project Area (Plate 14). Project construction activities would not have significant impacts on these soil series; however, these areas can not provide coversoil material for reclamation activities. Reclamation material for these areas would have to be obtained from suitable material salvaged and stockpiled elsewhere in the Project Area.

While disturbance of these areas would not increase erosion, application of erosion control measures between the rocky sites and adjacent soils would control runoff, and reduce erosion and subsequent gullying of adjacent soils.

Overlap of Soil Constraints

Thirteen percent of the soils that would be disturbed with implementation of the Proposed Action are both highly susceptible to erosion and highly saline. These very sensitive soils are distributed throughout the eastern half of the Project Area but generally do not occur in the vicinity of the Price River or Gordon Creek (Plate 15). Following successful reclamation of the pipeline ROWs, impacts would affect 328 acres for the long-term.

Approximately three percent of the soils that would be disturbed with implementation of the Proposed Action have a high erosion potential and are also unsuitable for use as reclamation material. All of this category of sensitive soils is located in Emery County, northeast of Elmo (Plate 15). Moderate to severe erosion of shaly colluvial land on mesas and benches, and stony alluvial land on the floodplains can increase erosion of adjacent, highly erodible soils. Impacts are not expected to be significant with the implementation of the erosion control measures discussed previously.

4.4.2.2 Alternative A

This alternative would affect about 41 percent more area than the Proposed Action, and impacts to sensitive soils would increase by 48 percent. Construction activities would initially impact 5,758 acres of soils; 3,585 acres would be affected for the life of the project. Short-term impacts to sensitive soils include:

- 1,590 acres of soils with a high erosion potential
- 1,929 acres of highly saline soils
- 207 acres of soils unsuitable for reclamation material

Alternative A would initially impact 819 acres of soils with a combination of high erosion potential and high salinity characteristics, and 160 acres of soils with a combination of high erosion potential and soils unsuitable for reclamation. Table 4.4-1 summarizes acres of impacts to sensitive soils on federal, UDWR, state, and private land.

Erosion

About 28 percent of soils disturbed under Alternative A have a potential for high erosion. Successful, reclamation of temporarily disturbed areas associated with the pipeline ROWs would reduce impacts to 998 acres of highly erodible soils for the long-term.

As previously discussed, soils with a high erosion potential occur throughout the Project Area and, therefore, would be difficult to avoid. Erosion rates would be essentially the same for this alternative as for the Proposed Action since the same types of construction activities would occur. However, the amount of soil loss would be increased due to the larger area of disturbance under this alternative. Soil loss could range from 36,441 to 1,540 tons per year (Appendix 4A, Table 4A-2).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Salinity

About 34 percent of soils disturbed under Alternative A are highly to very highly saline. Following construction activities, successful reclamation of the pipeline ROWs would

reduce impacts to 1,247 acres of saline soils for the long-term.

As previously discussed, saline soils occur throughout the Project Area, particularly in the eastern portion. Salinity levels would be essentially the same for this alternative as for the Proposed Action; however, the potential for increased salinity of the Price River and ultimately the Colorado River would increase due to the larger area of disturbance under this alternative. Potential salt loading estimates range from 255 to 11 tons per year (Appendix 4A, Table 4A-2).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Unsuitable Reclamation Material

Soils considered unsuitable for reclamation material comprise about four percent of the soils impacted by Alternative A. The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Overlap of Soil Constraints

Implementation of Alternative A would initially affect about 14 percent of soils in the disturbance area that are both highly susceptible to erosion and highly saline. Following successful reclamation of the pipeline ROWs, long-term impacts would be reduced to 529 acres.

Implementation of this alternative would also affect approximately 3 percent of soils in the disturbance area that have a high erosion potential and are unsuitable for use as reclamation material. About 102 acres would be affected long-term.

The impacts and mitigation measures discussed under the Proposed Action would also apply to this alternative.

4.4.2.3 Alternative B1

This alternative would affect about 7 percent fewer acres of sensitive soils than the Proposed Action. Construction activities would impact 3,151 acres of soils; 1,818 acres would be affected for the life of the project. Short-term impacts to sensitive soils include:

- 980 acres of soils with a high erosion potential
- 1,202 acres of highly saline soils
- 142 acres of soils unsuitable for reclamation material

Alternative B1 would impact 500 acres of soils with a combination of high erosion potential and high salinity characteristics, and 116 acres of soils with a combination of high erosion potential and soils unsuitable for reclamation material. Table 4.4-1 summarizes acres of impacts to sensitive soils on federal, UDWR, state, and private land.

Erosion

About 31 percent of soils disturbed under Alternative B1 have a potential for high erosion. Successful reclamation of temporary disturbance associated with the pipeline ROWs would reduce long-term impacts to 589 acres of highly erodible soils.

Erosion rates would be essentially the same for this alternative as for the Proposed Action since the same types of construction activities would occur. However, the amount of soil loss would be less due to the smaller area of disturbance under this alternative. The amount

of soil loss ranges from 22,346 to 944 tons per year (Appendix 4A, Table 4A-3).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Salinity

About 38 percent of soils disturbed under Alternative B1 are highly to very highly saline. Following construction activities, successful reclamation of pipeline ROWs would reduce long-term impacts to 747 acres of saline soils.

Since the reduction of acres disturbed under this alternative occurs in the western portion of the Project Area, the percentage of saline soils affected is larger than under the Proposed Action although the total number of acres affected would be slightly less. Salinity levels would be essentially the same for this alternative as for the Proposed Action; however, the potential for increased salinity of the Price River and ultimately the Colorado River would be less due to the smaller area of disturbance under this alternative. Potential salt loading estimates range from 167 to 7 tons per year (Appendix 4A, Table 4A-3).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Unsuitable Reclamation Material

Soils considered unsuitable for reclamation material comprise about five percent of the soils impacted by Alternative B1. The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Overlap of Soil Constraints

Implementation of Alternative B1 would initially affect 16 percent of soils in the disturbance area that are both highly susceptible to erosion and highly saline. Following successful reclamation of the pipeline ROWs, long-term impacts would be reduced to 311 acres.

Implementation of this alternative would also affect approximately 4 percent of soils in the disturbance area that have a high erosion potential and are unsuitable for reclamation material. About 71 acres would be affected long-term.

The impacts and mitigation measures discussed under the Proposed Action would also apply to this alternative.

4.4.2.4 Alternative B2

This alternative would affect about 39 percent more acres of sensitive soils than the Proposed Action. Construction activities would impact 4,510 acres of soils; 2,775 acres would be affected for the life of the project. Short-term impacts to sensitive soils include:

- 1,399 acres of soils with a high erosion potential
- 1,887 acres of highly saline soils
- 198 acres of soils unsuitable for reclamation material

Alternative B2 would impact 786 acres of soils with a combination of high erosion potential and high salinity characteristics, and 160 acres of soils with a combination of high erosion potential and soils unsuitable for reclamation. Table 4.4-1 summarizes acres of

impacts to sensitive soils on federal, UDWR, state, and private land.

Erosion

About 31 percent of soils disturbed under Alternative B2 have a high potential for erosion. Successful reclamation associated with the pipeline ROWs would reduce long-term impacts to 882 acres of highly erodible soils.

Erosion rates would be essentially the same for this alternative as for the Proposed Action since the same types of construction activities would occur. However, the amount of soil loss would be greater due to the larger area of disturbance of highly erodible soils under this alternative. The amount of soil loss ranges from 29,084 to 1,229 tons per year (Appendix 4A, Table 4A-4).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Salinity

About 42 percent of soils disturbed under Alternative B2 are highly to very highly saline. Following construction activities, successful reclamation of pipeline ROWs would reduce long-term impacts to 1,228 acres of saline soils.

Salinity levels would be essentially the same for this alternative as for the Proposed Action; however, the potential for increased salinity of the Price River and ultimately the Colorado River would increase due to the larger area of disturbance under this alternative. Potential salt loading estimates range from 229 to 10 tons per year (Appendix 4A, Table 4A-4).

Unsuitable Reclamation Material

Soils considered unsuitable for reclamation material comprise about four percent of the soils impacted by Alternative B2. The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Overlap of Soil Constraints

Implementation of Alternative B2 would initially affect 17 percent of soils in the disturbance area that are both highly susceptible to erosion and highly saline. Following successful reclamation of the pipeline ROWs, long-term impacts would be reduced to 511 acres.

Implementation of this alternative would also affect approximately 4 percent of soils in the disturbance area that have a high erosion potential and are unsuitable for reclamation material. About 102 acres would be affected long-term.

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Salinity levels and the potential for increased salinity of the Price River and ultimately the Colorado River would be essentially the same for this alternative as for the Proposed Action. Potential salt loading estimates range from 189 to 8 tons per year (Appendix 4A, Table 4A-5).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

4.4.2.5 **Alternative C1**

This alternative would affect about one percent fewer acres of sensitive soils than the Proposed Action. Construction activities would impact 3,778 acres of soils; 2,170 acres would be affected for the life of the project. Short-term impacts to sensitive soils include:

- 1,091 acres of soils with a high erosion potential
- 1,236 acres of highly saline soils
- 150 acres of soils unsuitable for reclamation material

Alternative C1 would impact 527 acres of soils with a -combination of high erosion potential and high salinity characteristics, and 116 acres of soils with a combination of high erosion potential and soils unsuitable for reclamation material. Table 4.4-1 summarizes impacts to sensitive soils on federal, UDWR, state, and private land.

Erosion

About 29 percent of soils disturbed under Alternative C1 have a high potential for erosion. Successful reclamation of the pipeline ROWs would reduce long-term impacts to 653 acres of highly erodible soils.

Erosion rates would be essentially the same for this alternative as for the Proposed Action since the same types of construction activities would occur. The amount of soil loss would be slightly less due to the smaller area of disturbance under this alternative. The amount of soil loss ranges from 26,956 to 1,139 tons per year (Appendix 4A, Table 4A-5).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Salinity

About 33 percent of the soils disturbed under Alternative C1 are highly to very highly saline. Following construction activities, successful reclamation of pipeline ROWs would reduce long-term impacts to 767 acres of saline soils.

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Unsuitable Reclamation Material

Soils considered unsuitable for reclamation material comprise about four percent of the soils impacted by Alternative C1. Long-term impacts would affect 88 acres. The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Overlap of Soil Constraints

Implementation of Alternative C1 would initially affect 14 percent of soils in the disturbance area that are both highly susceptible to erosion and highly saline. Following successful reclamation of the pipeline ROWs, long-term impacts would be reduced to 328 acres.

Implementation of this alternative would also affect approximately 3 percent of soils in the disturbance area that have a high erosion potential and are unsuitable for reclamation material. About 70 acres would be affected for the long-term.

The impacts and mitigation measures discussed under the Proposed Action would also apply to this alternative.

4.4.2.6 Alternative C2

This alternative would affect about 47 percent more acres of sensitive soils than the Proposed Action. Construction activities would impact 5,318 acres of soils; 3,306 acres would be affected for the life of the project. Short-term impacts to sensitive soils include:

- 1,561 acres of soils with a high erosion potential
- 1,929 acres of highly saline soils
- 206 acres of soils unsuitable for reclamation material

Alternative C2 would impact 820 acres of soils with a combination of high erosion potential and high salinity characteristics, and 160 acres of soils with a combination of high erosion potential and soils unsuitable for reclamation material. Table 4.4-1 summarizes of impacts to sensitive soils on federal, UDWR, state, and private land.

Erosion

About 29 percent of soils disturbed under Alternative C2 have a high potential for erosion. Successful reclamation of the pipeline ROWs would reduce long-term impacts to 986 acres of highly erodible soils.

Erosion rates would be essentially the same for this alternative as for the Proposed Action since the same types of construction activities would occur. However, the amount of soil loss would greater due to the larger area of disturbance under this alternative. The estimated amount of soil loss ranges from 33,759 to 1,426 tons per year (Appendix 4A, Table 4A-6).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Salinity

About 36 percent of the soils disturbed under Alternative C2 are highly to very highly saline. Following construction activities, successful reclamation of pipeline ROWs would reduce long-term impacts to 1,248 acres of saline soils.

Salinity levels would be essentially the same for this alternative as for the Proposed Action; however, the potential for increased salinity of the Price River and ultimately the Colorado River would be greater due to the larger area of disturbance under this alternative. Potential salt loading estimates range from 250 to 11 tons per year (Appendix 4A, Table 4A-6).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Unsuitable Reclamation Material

Soils considered unsuitable for reclamation material comprise about four percent of soils impacted by Alternative C2. Long-term impacts would affect 128 acres. The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Overlap of Soil Constraints

Implementation of Alternative C2 would initially affect 15 percent of soils in the disturbance area that are both highly susceptible to erosion and highly saline.

Following successful reclamation of the pipeline ROWs, long-term impacts would be reduced to 529 acres.

Implementation of this alternative would also affect approximately 3 percent of soils in the disturbance area that have a high erosion potential and are unsuitable for reclamation material. About 102 acres would be affected for the long-term.

The impacts and mitigation measures discussed under the Proposed Action would also apply to this alternative.

4.4.2.7 No Action Alternative

This alternative would affect about 47 percent fewer acres of sensitive soils than the Proposed Action. Construction activities would impact 1,907 acres of soils; 1,050 acres would be affected for the life of the project. Short-term impacts to sensitive soils include:

- 528 acres of soils with a high erosion potential
- 724 acres of highly saline soils
- 76 acres of soils unsuitable for reclamation material

The No Action alternative would impact 221 acres of soils with a combination of high erosion potential and high salinity characteristics, and 50 acres of soils with a combination of high erosion potential and soils unsuitable for reclamation material. Table 4.4-1 summarizes acres of impacts to sensitive soils on federal, UDWR, state, and private land.

Erosion

About 28 percent of soils disturbed under the No Action alternative have a potential for high erosion. Successful reclamation of associated with the pipeline ROWs would reduce long-term impacts to 303 acres of highly erodible soils.

Erosion rates would be essentially the same for this alternative as for the Proposed Action since the same types of construction activities would occur. However, the amount of soil loss would be less due to the smaller area of disturbance under this alternative. The estimated amount of soil loss ranges from 14,361 to 607 tons per year (Appendix 4A, Table 4A-7).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Salinity

About 38 percent of soils disturbed under the No Action alternative are highly to very highly saline. Successful reclamation following construction activities would reduce long-term impacts to 456 acres of saline soils.

Since the reduction of acres disturbed under this alternative occurs in the western portion of the Project Area, the percentage of saline soils affected is larger than under the Proposed Action although the total acres affected would be significantly fewer. Salinity levels would be essentially the same for this alternative as for the Proposed Action, however, the potential for increased salinity of the Price River and ultimately the Colorado River would be less due to the smaller area of disturbance under this alternative. Potential salt loading estimates range from 107 to 5 tons per year (Appendix 4A, Table 4A-7).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Unsuitable Reclamation Material

Soils considered unsuitable for reclamation material comprise about four percent of the soils impacted by the No Action alternative. The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Overlap of Soil Constraints

Implementation of the No Action alternative would initially affect 12 percent of soils in the disturbance area that are both highly susceptible to erosion and highly saline. Following successful reclamation of the pipeline ROWs, long-term impacts would be reduced to 165 acres.

Implementation of this alternative would also affect approximately 3 percent of soils in the disturbance area that have a high erosion potential and are unsuitable for reclamation material. About 29 acres would be affected long-term.

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

4.4.3 Impacts Summary

A summary comparison of the impacts of the alternatives is presented in Table 2.7-2. Implementation of the Proposed Action or any one of the alternatives would affect between 1,907 acres and 5,758 acres. Successful reclamation efforts along the pipeline ROWs would reduce long-term impacts to 3,585 acres to 1,050 acres. Long-term impacts resulting from construction and operation of drill pads and access roads, site facilities, and evaporation ponds could include removal of vegetation, exposure of the soil, mixing of soil horizons, soil compaction, loss of topsoil productivity, and increased susceptibility of the soil to erosion. These impacts could increase runoff, erosion, and off-site sedimentation, particularly of saline soils. Natural erosion of soils in the Project Area can be as much as 12 tons per acre per year and implementation of any of the alternatives could be expected to increase erosion, particularly in the soils with a naturally high potential for erosion. Estimated erosion rates range from 0.7 to 16.8 tons per acre per year. Soil loss estimates range from 607 to 36,440 tons per year (Appendix 4A, Table 4A-7).

Along with increased erosion, sedimentation of saline soils and increased salt loading of the Colorado River system could be expected. Potential salt loading estimates range from 5 to 255 tons per year (Appendix 4A, Table 4A-7) depending on the amount of disturbance and the type of reclamation measures implemented.

Although sensitive soils occur throughout the Project Area and are unavoidable, impacts could be kept to non-significant levels with the application of the environmental protection measures described in Section 2.2.5.

4.4.4 Mitigation

As with any adverse impact, avoidance of the impact should be considered first. Avoidance of particularly sensitive soil areas should be given attention in both the project planning and project construction phases. Particular sensitive soil areas that should be avoided include those with a high erosion potential, high salinity and badlands, rock outcrops, barren shale and riverwash material. As

indicated previously, 49 percent of the analysis area comprises sensitive soils, 17 percent of which includes areas with combinations of the sensitive soils mentioned above. Sensitive soils should be avoided where feasible; however, given their wide distribution and area covered, complete avoidance would likely not be feasible. Therefore, special measures or best management practices would need to be implemented to minimize the chance of significant impacts resulting from construction in sensitive soils.

Recommended measures that should be considered in minimizing adverse impacts include careful construction and performance monitoring to ensure effective application of control measures. These measures primarily address the issues of surface runoff, erosion, and sedimentation control as well as effective revegetation of disturbed areas.

To prevent excessive rill and gully development where surface water runoff is channelized, ditches, culverts, and waterbars should be designed to intercept overland flow and disperse it to stable locations. Sediment retention devices such as silt fences, bales of straw, or recontouring disturbed areas to reduce runoff velocities and contain saline soils may be needed to prevent soils from entering downstream drainages. Additionally, minimizing soil disturbance within a 500-foot buffer zone of perennial surface water would also reduce potential impacts from erosion of saline soils.

The soil loss calculations in Appendix 4A highlight the significance of applying erosion control measures which can effectively reduce erosion up to 85 percent. Successful vegetation could reduce erosion rates up to 96 percent. Similarly, sedimentation and salt loading could also be significantly reduced with effective application of the environmental protection measures.

Incomplete application of these measures, where needed, could result in failed erosion control and revegetation efforts. Such measures, if applied, would reduce impacts to soils. Additionally, through the construction of erosion control structures in areas of naturally accelerated erosion, current erosion rates could be reduced with implementation of any of the project alternatives.

4.4.5 Unavoidable Adverse Impacts

No significant unavoidable adverse impacts to soils would occur due to development of the Proposed Action or other alternatives with the implementation of mitigation stipulations identified in Section 2 and Appendix 1B. Although successful surface runoff, erosion, and sedimentation control is feasible on most of the soils in the Project Area, there is a residual chance of ineffective application of control measures. Significant unavoidable adverse impacts are unlikely given the range of mitigation measures available to the operators. However, failure to apply best management practices during the planning, construction, or performance monitoring phases could result in significant localized impacts.

4.5 VEGETATION

4.5.1 Introduction

Direct disturbance or removal of vegetation would occur from construction of well pads, transportation corridors, and other facilities, and can be quantified by acres affected. The disturbance may be short-term, for example from pipeline construction; or long-term, where previously vegetated areas would be

occupied by wells, roads or other semi-permanent facilities. Where disturbance is short-term, the ecological effects may be either short or long-term, depending on the plant community affected and the success of revegetation. Areas of short-term impacts would be reclaimed shortly after disturbance, while areas occupied by semi-permanent facilities would be reclaimed at the end of the economic lifespan of the facility. The success or failure of revegetation may have adverse effects on other resources, including wildlife, visual resources, recreation and livestock grazing.

The relative significance of impacts to the different vegetation types in the Proposed Action depends on their social and ecological sensitivity and importance:

> Riparian and wetland areas are considered sensitive because of their importance for wildlife habitat and biotic diversity, their role in water quality protection, and specific laws or federal agency policy protecting them. Wetlands are discussed in more detail in Section 4.6. In addition, wooded riparian habitats require a longer time to regain current conditions after disturbance and revegetation than shrub and herbaceous communities.

> Pinyon-juniper woodland also has a much longer recovery period than other communities, up to 150 years to regain mature woodland. Impacts to pinyon-juniper woodland may affect visual resources (Section 4.12) and wildlife habitat. Pinyon-juniper woodlands also provide thermal cover to wintering mule deer and elk.

> Impacts to sagebrush-grass, salt desert and mountain shrub communities are generally considered less sensitive because of their shorter recovery time and their relative abundance. However, impacts to these communities in big game critical winter range may have short- to mid-term consequences, depending on the success of revegetation, and would affect carrying capacity of the critical habitat during the period required to re-establish vegetation.

Indirect impacts to vegetation may occur from introduction or spread of noxious weeds, from increases in fire, accidental spills of fuels, lubricants, or other materials, and fugitive dust.

A number of environmental protection measures are required by law or by agency regulation, or committed to by RGC (Section 2.2.5). Measures specifically providing for protection or reclamation of vegetation include RGC 7 (reclamation), RGC 8 and 9 (noxious weeds), BLM 1 (siting, including avoidance of wetlands and riparian), BLM 2-3 (erosion control) BLM 4-5 (avoidance of streams and springs), BLM 6-7 (minimization of disturbance), BLM 8-23 (reclamation and erosion control), BLM 24 (control of wildfire), and BLM 36 (minimization of impacts in wetlands and riparian areas).

Reclamation would be required for all project facilities under either BLM or UDOGM regulations, and bonding is required by both the BLM and UDOGM. Enhancement of existing vegetation would be required to mitigate impacts to big game critical winter habitat, under environmental protection measure BLM 38.

The impacts associated with each of the alternatives are discussed below, including effects on specific vegetation types, noxious weeds, and revegetation. Other potential impacts, such as accidental spills of fuels, lubricants, or other materials, and fugitive dust, would be likely to have only minor and local effects on vegetation. Increases in range fires could potentially occur under all alternatives because of increased human presence in the Project Area.

4.5.2 Direct and Indirect Impacts

4.5.2.1 Proposed Action

Vegetation Types

The acres of directly-impacted vegetation are presented in Table 4.5-1. A total of 4,095 acres of vegetation would be affected by construction, and 2,353 acres would be occupied by project facilities during operation. The largest impacts would occur in the sagebrush/grass vegetation type, and more than half of the total acres affected would be in this type. About one-fourth of the impacts would occur in salt desert, and about one-eighth in pinyon-juniper woodland. Montane and subalpine communities would not be directly affected, and only minor amounts of mountain shrub would be affected. Overall, construction would affect about 2.2 percent of the vegetation in the Project Area, and operations facilities would occupy 1.2 percent of the area. The Project Area would remain predominantly in natural vegetation, and the maximum proportion of impact in any vegetation type would be 2.9 percent (sagebrush-grass).

About 73 acres of riparian/wetland vegetation would be affected during construction, and 42 acres would be occupied by facilities during operation, based on the proposed locations of facilities. However, riparian areas would be avoided during final selection, design and permitting of facilities, and actual impacts are likely to be substantially less. Since riparian areas are mostly small and scattered, wells and some sections of transportation corridors would easily be relocated short distances to avoid direct disturbance. Where disturbance to riparian areas would not be avoided, the magnitude of impacts would be reduced by avoiding wooded and higher quality shrub riparian areas, and routing transportation corridors through more disturbed or lower quality habitat. Most of the potential riparian/wetland impact area is on private land adjacent to agricultural fields.

Pinyon-juniper woodlands would have about 470 acres of construction impacts (1.4 percent of this type in the Project Area), and 275 acres of operational impacts (0.8 percent). The approximately 200 acres difference includes transportation corridors which would be subject to short-term disturbance. Because of the long time required to re-establish mature pinyon-juniper woodlands, impacts to all of these areas would be long-term, even if young pinyon and juniper trees re-establish quickly in revegetated areas. Impacts to pinyon-juniper woodlands would occur in small blocks at well sites and in relatively narrow transportation corridors scattered through the Project Area and there would not be any areas with large-scale removal of woodlands.

Noxious Weeds

Noxious weeds may invade areas disturbed by construction, and may spread along the cleared transportation corridors and along roads. Soil disturbance may also allow weed seed already present to germinate and grow, freed from competition. Species of greatest concern are probably Russian knapweed,

other knapweed species, musk thistle and Scotch thistle in upland areas; and leafy spurge, Canada thistle, quackgrass, field bindweed, and white top in agricultural and riparian areas. As described in Section 3.5, there have been minor problems on RGC facilities to date, involving small numbers of musk thistle, but there have been no formal complaints or actions involving RGC facilities. Musk thistle would likely be a bigger problem on developments in the western portion of the Project Area than where existing RGC facilities are located (Wise 1996). In addition, the much larger area of construction disturbance in the Proposed Action could result in increased noxious weed problems. Under some circumstances noxious weeds could be numerous enough to interfere with revegetation, or could invade natural vegetation outside the disturbed area. The spread of noxious weeds would be considered significant if it resulted in uncontrolled new infestations of noxious weeds on areas disturbed by the project or on adjacent areas.

Several project components would help to control the spread of noxious weeds, including revegetation, use of weed-free seed, and use of weed control measures as necessary. Weed control might include mechanical methods such as harrowing or disking, or chemical controls. If chemical control were used, prior approval would be obtained from the landowner, and only chemicals approved for the specific application would be used.

Under the Utah Noxious Weed Act, landowners are required to control noxious weeds on lands under their control. If this is not done, the county weed boards have the authority to perform control measures at the expense of RGC, after notification and hearing. Given the legal requirement for weed control, a regulatory mechanism that ensures compliance, and RGC commitment to monitor and control noxious weeds, significant impacts from the spread of noxious weeds would be unlikely.

Revegetation

The proposed project includes reclamation of disturbed areas, either immediately after construction (pipelines) or at the end of the useable life of the facility. Disturbed lands would be revegetated to BLM or landowners specifications, with the goal of replacing removed vegetation with new vegetation of equal or greater forage and watershed values.

Specific seed mixes have been developed by the BLM for each major vegetation type in the Price CBM Project Area (Appendix 2F). Grass, forb, and shrub species were selected which would provide the greatest chance for successful long-term establishment of a stable and diverse community, and based on guidelines in Interagency Forage and Conservation Planting Guide for Utah (Utah Interagency Plant Materials Committee, no date). Use of native species in seed mixtures was dictated based on past success. Species were selected based on erosion control, forage production, elevation, soils, vegetation communities and average precipitation zones. Appendix 2F presents mixes for salt desert, sagebrush-grass, pinyon-juniper, mountain brush, riparian, and disturbed areas. These or similar seed mixtures would also be used on UDWR, Utah School and Institutional Trust Lands, and private lands, depending on landowner requirements. Fall seeding would likely have the greatest success (because of winter moisture) and would be used where feasible. Seedlings and/or planting would be repeated as necessary until satisfactory revegetation is accomplished as determined

by BLM or other landowners. Salvage and replacement of topsoil would aid in revegetation by preserving and replacing existing seed banks and by returning to the soil organic matter needed for seed establishment. Temporary erosion controls would be used as needed until vegetation became established. Appropriate seedbed preparation would be needed, possibly including ripping, pitting, or use of mulch to increase the percentage of soil organic material.

Revegetation would result in impacts if it were unsuccessful. Removal of vegetation would be considered significant, if after reclamation, disturbed areas did not have adequate cover, diversity and composition to support pre-existing land uses, including use as wildlife habitat. The time span for assessment of successful reclamation would be five years in upland habitats, and two years in agricultural, riparian and wetland habitats.

As described in the affected environment, environmental conditions in the Project Area may make revegetation difficult. They include low and erratic precipitation especially in the salt desert areas, high erosion potential and/or salinity in some areas, and likely use of revegetation plants by grazing animals. Revegetation efforts on RGC facilities to date have reportedly been mostly successful in 1993 to 1995, after poor success in 1992. However, if revegetation success is monitored and areas re-treated as necessary until success is achieved, significant impacts would be unlikely in most areas.

Revegetation in mule deer winter range represents a special case. Because mule deer are browsers, re-establishment of pre-existing habitat values may not occur within five years, because shrubs are slower to establish than grasses and forbs.

4.5.2.2 Alternative A

This alternative would affect about 40 percent more area than the Proposed Action, a total of 5,758 acres of vegetation during construction, and 3,585 acres during operation. The distribution of impacts by vegetation type would be similar to the Proposed Action - about half of the total acres affected would be sagebrush-grass, about 27 percent would be salt desert, and about 11 percent would be pinyon-juniper. Montane and subalpine communities would not be directly affected, and only minor amounts of mountain shrub would be affected. Overall, construction would affect about 3.1 percent of the vegetation in the Project Area, and operations facilities would occupy 1.9 percent of the area. The Project Area would remain predominantly in natural vegetation, and the maximum proportion of impacts in any vegetation type would be 3.8 percent (sagebrush-grass).

The acreage of potential impacts to riparian and wetland vegetation would be about 50 percent larger, 100 acres during construction and 63 acres during operation. As with the Proposed Action, actual impacts would likely be substantially less because of avoidance of these areas during final location, design and permitting of facilities. Most of the potential riparian/wetland impact area is on private land adjacent to agricultural fields, and not subject to BLM authority.

The acreage of impacts to pinyon-juniper woodlands would be about 40 percent larger under this alternative than the Proposed Action, 658 acres during construction impacts (2 percent of this type in the Project Area), and 412 acres during operational impacts (1.2

percent). The types of impacts would be the same as for the Proposed Action.

The types of noxious weeds impacts would be similar to those identified for the Proposed Action. More lands would be disturbed under this alternative, and more weed control would be required. The types of revegetation impacts and reclamation requirements would also be the same as for the Proposed Action.

4.5.2.3 Alternative B1

This alternative would affect about 25 percent less lands than the Proposed Action, a total of 3,151 acres of vegetation during construction, and 1,818 acres during operation. Impacts would primarily occur in the sagebrush-grass and salt -desert vegetation types. Overall, construction would affect about 1.7 percent of the vegetation in the Project Area, and operations facilities would occupy 1.0 percent of the area. The Project Area would remain predominantly in natural vegetation, and the maximum proportion of impacts to any vegetation type would be 2.1 percent (sagebrush-grass).

The acreage of potential impacts to riparian and wetland vegetation would be the same as for the Proposed Action, 73 acres during construction and 42 acres during operation. As with the Proposed Action, actual impacts would likely be substantially less because of avoidance of these areas during final location, design and permitting of facilities. Most of the potential riparian/wetland impact area is on private land adjacent to agricultural fields.

The acreage of impacts to pinyon-juniper woodlands would be only about half the area affected by the Proposed Action, 235 acres during construction and 126 acres during operation (0.7 and 0.4 percent, respectively of the area of this type in the Project Area). The types of impacts would be the same as for the Proposed Action.

The types of noxious weeds impacts would be similar to those identified for the Proposed Action. The types of revegetation impacts and reclamation requirements would also be the same as for the Proposed Action.

4.5.2.4 Alternative B2

This alternative would affect slightly more area than the Proposed Action, a total of 4,510 acres of vegetation during construction, and 2,775 acres during operation. Impacts would primarily occur in the sagebrush-grass and salt desert vegetation types. Overall, construction would affect about 2.4 percent of the vegetation in the Project Area, and operations facilities would occupy 1.5 percent of the area. The Project Area would remain predominantly in natural vegetation, and the largest proportion of impacts to any vegetation type would be 3.0 percent (salt desert), and 2.8 percent (sagebrush-grass).

The acreage of potential impacts to riparian and wetland vegetation would be 40 to 50 percent larger than the Proposed Action, 100 acres during construction and 63 acres during operation. As with the Proposed Action, actual impacts would likely be substantially less because of avoidance of these areas during final location, design and permitting of facilities. Most of the potential riparian/wetland impact area would be on private land adjacent to agricultural fields.

The acreage of impacts to pinyon-juniper woodlands would be about 30 percent less than the Proposed Action, 325 acres during construction (1.0 percent of this type in the Proposed Action), and 188 acres during operation (0.6 percent). The types of impacts would be the same as for the Proposed Action.

The types of noxious weed impacts would be similar to those identified for the Proposed Action. The types of revegetation impacts and reclamation requirements would also be the same as for the Proposed Action.

4.5.2.5 Alternative C1

Alternative C1 would affect about 8 percent less vegetated lands than the Proposed Action: about 3,778 acres from construction, and 2,170 acres during operation. As with previously discussed alternatives, impacts would occur mainly in the sagebrush-grass and salt desert vegetation types. Construction activities would affect about 2.0 percent of the vegetation in the Project Area, and operational facilities would occupy 1.2 percent of the vegetation. The Project Area would remain primarily in natural vegetation, and the largest impacts to any vegetation type would be 2.6 percent (sagebrush-grass).

The acreage of potential impacts to riparian and wetland vegetation would be the same as the Proposed Action, 73 acres during construction and 42 acres during operation. Actual impacts would likely be substantially less because these areas would be avoided during final location and permitting of the facilities. Most of the potential impact area is on private land adjacent to agricultural areas.

The area of impacts to pinyon-juniper woodlands would be about 12 percent less than with the Proposed Action, 408 acres during construction, and 236 acres during operation. These represent 1.2 and 0.7 percent, respectively, of the mapped areas of pinyon-juniper woodland in the Project Area. The types of impacts would be the same as described for the Proposed Action.

The types of noxious weed impacts would be similar to those identified for the Proposed Action. The types of revegetation impacts and mitigations would also be the same as for the Proposed Action. A slightly smaller area would require revegetation after construction of pipelines and at the closure of the project.

4.5.2.6 Alternative C2

Alternative C2 would affect about 40 percent more vegetated lands than the Proposed Action: about 5,318 acres from construction, and 3,306 acres during operation. As with previously discussed alternatives, impacts would occur mainly in the sagebrush-grass and salt desert vegetation types. Construction activities would affect about 2.8 percent of the vegetation in the Project Area, and operational facilities would occupy 1.7 percent of the vegetation. The Project Area would remain primarily in natural vegetation, and the largest impacts to any vegetation type would be 3.4 percent (sagebrush-grass).

The acreage of potential impacts to riparian and wetland vegetation would be larger than the Proposed Action and the same as Alternative A, 100 acres during construction and 62 acres during operation. Actual impacts would likely be substantially less because these areas would be avoided during final location and permitting of the facilities. Most of the potential impact area is on private land adjacent to agricultural areas.

The area of impacts to pinyon-juniper woodlands would be about 20 percent larger than with the Proposed Action, but smaller than Alternative A, 560 acres during construction, and 347 acres during operation. These represent 1.7 and 1.0 percent, respectively, of the mapped areas of pinyon-juniper woodland in the Project Area. The types of impacts would be the same as described for the Proposed Action.

The types of noxious weed impacts would be similar to those identified for the Proposed Action. The types of revegetation impacts and reclamation requirements would also be the same as for the Proposed Action. A larger area would require revegetation after construction of pipelines and at the closure of the project.

4.5.2.7 No Action Alternative

This alternative would affect slightly less than half the area of the Proposed Action, a total of 1,907 acres of vegetation during construction, and 1,050 acres during operation. Impacts would primarily occur in the sagebrush-grass, salt desert vegetation and agriculture types. Overall, construction would affect about 1.0 percent of the vegetation in the Project Area, and operations facilities would occupy 0.6 percent of the area. The Project Area would remain predominantly in natural vegetation, and the largest proportion of impacts to any vegetation type would be agriculture (1.4 percent).

The acreage of potential impacts to riparian and wetland vegetation would be less than the Proposed Action, 57 acres during construction and 33 acres during operation. As with the Proposed Action, actual impacts would likely be substantially less because of avoidance of these areas during final location, design and permitting of facilities. Most of the potential riparian/wetland impact area is on private land adjacent to agricultural fields.

The acreage of impacts to pinyon-juniper woodlands would be less than half the area affected by the Proposed Action, 171 acres during construction and 86 acres during operation (0.5 and 0.3 percent, respectively of the area of this type in the Project Area). The types of impacts would be the same as for the Proposed Action.

The types of noxious weed impacts would be similar to those identified for the Proposed Action. This alternative would disturb less land than the Proposed Action. Significant increases in noxious weeds would be unlikely. The types of revegetation impacts and reclamation requirements would also be the same as for the Proposed Action.

4.5.3 Impacts Summary

A comparison of the impacts of the Proposed Action and the six alternatives is provided in Table 2.7-2. All of the alternatives, including No Action, would involve removal or disturbance of large areas of vegetation. The largest impacts would occur under Alternative A (5,748 acres of construction impacts), and the smallest would be No Action (1,907 acres). Impacts would be scattered through the Project Area, and would not be concentrated in any one area or vegetation type. The proportion of vegetation affected would range from about 1 to 3 percent for the various alternatives. The Project Area would remain predominantly in natural vegetation.

The distribution of impacts among vegetation types would be generally similar among all alternatives. The vegetation types with the largest proportions affected in most alternatives would be sagebrush-grass and salt desert, up to 3.8 percent in Alternative A. The area of affected riparian and wetland vegetation has been estimated at 57 to 100 acres under the various alternatives, but is most likely an over-estimate because these areas would be avoided during final siting of facilities. Between 171 and 658 acres of pinyon-juniper woodland would be affected under the various alternatives, in scattered areas, and would have long-term impacts.

All affected areas would be revegetated either immediately following construction, or at the end of the economic life of a facility. All of the alternatives include areas where revegetation may be difficult; and repeated reclamation efforts may be required to ensure adequate revegetation. The alternatives differ mainly in the extent of surface disturbance which would require reclamation. The Proposed Action and Alternative A would include habitat enhancement of relatively large areas, to make up for losses of browse production in critical mule deer winter range.

A number of noxious weeds could invade the Project Area. Although noxious weeds have not been a major concern on RGC facilities to date, they may become a bigger problem if the area of disturbance greatly increases. Existing regulatory mechanisms are adequate, but would only work with proper monitoring of disturbed areas associated with the project. RGC's commitment to train its personnel in weed identification would help to provide monitoring, if fully implemented.

4.5.4 Mitigation

Existing environmental protection measures would be generally adequate. The following additional mitigations are recommended.

- RGC should consider an agreement with the county weed control agencies to perform weed monitoring and control on project facilities, since the counties have certified personnel to monitor and spray.
- Locations, procedures, responsibilities, and funding for habitat enhancement projects would be developed in coordination with BLM and UDWR prior to disturbance of mule deer or elk critical winter range.
- Impacts to pinyon-juniper woodland should be assessed on a case-by-case basis during final design, and minor relocations of facilities made where appropriate to reduce cutting of trees.

4.5.5 Unavoidable Adverse Impacts

Short and long-term removal and disturbance to vegetation would occur under all alternatives and cannot be avoided, although the area affected would be reduced under some alternatives. Permanent reductions in the area of natural vegetation communities would only occur if project roads are maintained by landowners at the end of the project.

4.6 WETLANDS

4.6.1 Introduction

Potential impacts to wetlands include filling, excavating, clearing and grading, and drainage. These impacts may reduce the area and the functional value of affected wetlands. Short-term impacts may result from construction of pipelines across wetlands, and long-term impacts may be caused by placement of permanent facilities such as well pads or roads in wetlands. Long-term impacts including changes in wetland area or function could also result from improper construction techniques such as placement of culverts and backfill.

Impacts to wetlands are subject to the provisions of Section 404 of the Clean Water Act, and any project feature affecting wetlands would require a permit. Project facilities would most likely be authorized under nationwide permits, including Nationwide Permit No. 12 (utility lines) for pipelines and transmission lines, and Nationwide Permit No. 14 (road crossings). They might also be covered by Nationwide

Permit No. 26 (headwaters and isolated wetlands discharges). Nationwide permits are subject to various conditions and notification requirements designed to minimize impacts. For example, No. 12 requires backfilling of the surface of the trench with topsoil removed from the trench, removal of excess material from the wetland immediately after construction, and immediate stabilization of exposed slopes and streambanks. Nationwide permit No. 14 only applies to fills of less than 200 linear feet of roadway, and filled areas of less than 1/3 acre. Both Nationwide Permits Nos. 14 and 26 require a pre-discharge notification to the COE, including delineation of affected wetland areas. Project features which could not meet the requirements of the appropriate nationwide permits would either have to be redesigned to meet requirements and reduce impacts, or go through an individual Section 404 permit process.

Several of the environmental protection measures described in Section 2.2.5 apply to wetlands, including RGC 7 (reclamation), RGC 8 and 9 (noxious weeds), BLM 1 (siting, including avoidance of wetlands and riparian), BLM 4-5 (avoidance of streams and springs), BLM 6-7 (minimization of disturbance), BLM 8-23 (reclamation and erosion control), BLM 24 (control of wildfire), and BLM 36 (minimization of impacts in wetlands and riparian areas). Requirements for seeding and planting in disturbed wetland and riparian areas on BLM land are provided in Appendix 2F.

Application of these mitigations and of the Section 404 permit conditions would minimize encroachment on wetlands and would help ensure that areas of temporary construction disturbance are adequately restored.

4.6.2 Direct and Indirect Impacts

4.6.2.1 <u>Proposed Action</u>

Specific project impacts on wetlands cannot be accurately assessed prior to wetland delineation, application of environmental protection measure BLM 1, minimizing of encroachment on wetlands (and similar on-site protections on other lands), and initiation of the Section 404 permitting process. This analysis therefore focuses on potential areas of impact: those areas mapped as riparian on federal lands by the BLM, and areas mapped as riparian/ wetland in Plate 16. These two sources were mapped by different techniques, and acres from them cannot be directly compared (See Section 3.5). In addition, both sources do not separate wetlands and riparian areas. The ecological differences and similarities between wetland and riparian areas are described in Section 3.5.2. Impacts to wetlands are regulated under the Clean Water Act, and riparian areas (both wetland and non-wetland riparian) are protected under BLM management policies. This section is focused on wetland impacts; areas of riparian and wetland/riparian are presented only as a measure of potential wetland impacts.

On BLM lands, areas mapped as riparian include 4.7 acres of construction impacts and2.6 acres of operational impacts. About 0.5 acres are at proposed wells, and the remainder is transportation corridors. Riparian types include cottonwood, tamarisk, and perennial and annual forbs and grasses. In the entire Project Area, areas mapped as riparian/ wetland occupy 73 acres of the proposed construction area, and 42 acres of proposed operations area (Table 4.5-1). These represent, respectively, 1.4 and 0.8 percent of the area mapped as riparian and wetlands vegetation. Wetlands probably occupy a portion of these

areas, but the exact locations and acres are not available.

Areas of potential impact include both proposed wells (about 16.6 acres) and transportation corridors (resource roads). Since wetlands are small and scattered, well sites could easily be relocated short distances to avoid impacts, if wetlands are present at the proposed locations. Some sections of transportation corridors crossing riparian/ wetland areas may also be able to be relocated, but avoidance may not be possible at crossings. Both short and long-term impacts may occur at crossings.

Where construction in wetlands could not be avoided, activities would be subject to Section 404 permit requirements and conditions, and to project stipulations covering construction methods and restoration of affected wetlands. Assuming compliance with the Clean Water Act, wetland impacts would be mostly short-term and within allowable limits. If the amount of wetlands affected exceeds limits set by the COE, compensatory wetland creation could be required. Impacts to wetlands would be considered significant if they were unauthorized, or if they were in violation of permit conditions.

4.6.2.2 Alternative A

The types of impacts and mitigations would be similar to the Proposed Action, but the area of potential impact would be larger. On BLM lands, areas mapped as riparian include 6.3 acres of construction impacts and 3.4 acres of operational impacts. About 0.5 acres are at proposed wells, and the remainder is transportation corridors. Riparian types include cottonwood, tamarisk, and perennial and annual forbs and grasses. In the entire Proposed Action, areas mapped as riparian/ wetland occupy 100 acres of the proposed construction area, and 63 acres of the proposed operations area. These represent, respectively, 2.0 and 1.3 percent of the area mapped as riparian and wetland vegetation in the Project Area. Wells would occupy 30.7 acres of these totals.

4.6.2.3 Alternative B1

The types of impacts and mitigations would also be similar to the Proposed Action, and the area of potential impact would be similar. On BLM lands, areas mapped as riparian include 4 acres of construction impacts and 2 acres of operational impacts. Nearly all of this area is in transportation corridors. Riparian types include cottonwood, tamarisk, and perennial and annual forbs and grasses. In the entire Project Area, impacts to areas mapped as riparian/wetland would be the same as the Proposed Action: 73 acres of the proposed construction area, and 42 acres of the proposed operations area, representing 1.4 and 0.8 percent of the mapped area. Wells would occupy 16.6 acres of these totals.

4.6.2.4 Alternative B2

The types of impacts and mitigations would be similar to the Proposed Action, but the area of potential impact would be greater. On BLM lands, areas mapped as riparian include 5.5 acres of construction impacts and 2.8 acres of operational impacts. Nearly all of this area would be affected by transportation corridors. Riparian types include cottonwood, tamarisk, and perennial and annual forbs and grasses. In the entire Project Area, areas mapped as riparian/wetland occupy 100 acres of the proposed construction area, and 63 acres of the proposed operations area. These represent, respectively, 1.9 and 1.2 percent of the area mapped as riparian and wetland vegetation in the Project Area. Wells would occupy 30.7 acres of these totals.

4.6.2.5 Alternative C1

The types of impacts and mitigations would be similar to the Proposed Action, and the area of potential impact would be similar. On BLM lands, areas mapped as riparian include 4.4 acres of construction impacts and 2.4 acres of operational impacts. About 0.5 acres are at proposed wells, and the remainder is in transportation corridors. In the entire Project Area, impacts to areas mapped as riparian/wetland would be the same as for the Proposed Action: 73 acres of the proposed construction area, and 42 acres of the proposed operations area, representing 1.4 and 0.8 percent of the mapped area. Wells would occupy 16.6 acres of these totals.

4.6.2.6 Alternative C2

The types of impacts and mitigations would be similar to the Proposed Action, but the area of potential impact would be larger. On BLM lands, areas mapped as riparian include 5.8 acres of construction impacts and 3.2 acres of operational impacts. About 0.5 acres are at proposed wells, and the remainder is in transportation corridors. In the entire Project Area, impacts to areas mapped as riparian/wetland would be 100 acres of the proposed construction area, and 63 acres of the proposed operations area, representing 1.9 and 1.2 percent of the mapped area. Wells would occupy 31 acres of these totals.

4.6.2.7 No Action

The types of impacts and mitigations would be similar to the Proposed Action, but the area of potential impact would be less. On BLM lands, areas mapped as riparian include 0.7 acres of construction impacts and 0.4 acres of operational impacts. All impacts would be from transportation corridors. The only riparian type affected would be cottonwood.

In the entire Project Area, areas mapped as riparian/wetland occupy 57 acres of the proposed construction area, and 33 acres of the proposed operations area. These represent, respectively, 1.2 and 0.7 percent of the area mapped as riparian and wetland vegetation in the Project Area. Wells would occupy 13.0 acres of these totals.

4.6.3 Impacts Summary

A comparison of the impacts of the Proposed Action and the six alternatives is provided in Table 2.7-2. All of the alternatives have the potential to adversely affect wetland area and functions. The area of potential effect is greatest for Alternatives A, B2, and C2; less for the Proposed Action and Alternative B1 and C1 (about 70 percent of Alternative A); and least for No Action (about 50 percent of Alternative A). Although the actual extent of impacts cannot be determined now, the probable extent of adverse effects are likely to be roughly proportional to the potential area of effect. More miles of transportation corridors are likely to result in more wetlands that cannot be avoided. However, all alternatives would be subject to the same permitting and mitigation requirements, ensuring that impacts would be acceptable under the provisions of the Clean Water Act.

4.6.4 Mitigation

Environmental protection measures applicable to wetlands have been presented above. They include permitting and compliance requirements under Section 404 of the Clean Water Act, and some project wide-mitigations and BLM stipulations. No additional mitigations are required.

4.6.5 Unavoidable Adverse Impacts

Unavoidable reductions of wetland area and functions may occur at transportation crossings. Short-term adverse effects could occur from pipeline construction, and long-term adverse effects from road construction and operation. The extent of losses cannot be quantified with existing information. However, all activities in wetlands will be subject to the provisions of Section 404 of the Clean Water Act, and impacts will be consistent with COE implementation of Section 404.

4.7 WILDLIFE

4.7.1 Introduction

This section is organized to describe:

- The specific phases of gas field development (construction, operation, and abandonment/reclamation) that may affect wildlife, and environmental protection measures designed to minimize impacts

- The direct and indirect impacts for big game, raptors, and species of management concern, to serve as the basis for analysis of impacts of each of the alternatives

- Actual impacts by alternative for the major species present in the Project Area.

The Price CBM Project would occur in several phases, which would have different effects on wildlife based on the type and extent of activity:

Construction

This phase includes pre-construction permitting and siting of facilities, construction of well pads, pipelines, electrical utilities, produced water disposal facilities, and compressor stations; construction or improvement of access roads; and drilling and completion of gas wells. These activities would require numerous personnel and equipment. They would occur over a period of several months in any single year, and would take 6 to 10 years to complete for all of the proposed facilities.

In general, construction activities would be clustered in specific geographic areas in any one year (Plate 3), and would not be dispersed throughout the Project Area. About 40 percent of the area disturbed by construction would be reclaimed within the same year (areas used for pipeline and electrical powerline construction). The remainder of the area disturbed during construction would be occupied by aboveground facilities for the life of the project.

Operation

Wells would operate for approximately 20 years. During this period, human activity would be less than during construction but would continue throughout the year. The primary activities which may have the greatest effect on wildlife would be human activity during the winter associated with regular visits to well pads, facility maintenance, road maintenance and snow removal, and increased use of the area by the public. Gas production, treatment and collection, compression, and produced water disposal would involve minimal personnel in the field except at compressor stations and water disposal facilities.

Abandonment and Reclamation

At the end of the operational life of each well, RGC would remove its facilities, and reclaim well sites and access roads. Access roads would be left in place if requested by the landowner. These activities would involve a short-term increase in people and vehicles in the Project Area. Abandonment and reclamation activities would require approximately three days per well and four days per mile of access road, for a crew of 4 people.

A number of environmental protection measures are required by law or by agency regulation, or committed to by RGC (Section 2.2.5). Measures specifically developed for protection of wildlife include RGC 10, RGC 11, RGC 12, RGC 14, RGC 15, and RGC 16, and BLM 37, BLM 38, BLM 39, and BLM 40. In addition, environmental protection measures governing placement of facilities, reclamation, and other activities would also serve to reduce impacts to wildlife.

Two major environmental protection measures are included in the description of the Proposed Action (Section 2.2): restriction of construction on BLM land within one-half mile of an active raptor nest, and development of gates on access roads, which would be closed in winter to limit disturbance to wintering big game.

4.7.2 Direct and Indirect Impacts

The following general discussion of the direct and indirect impacts of CBM development on big game, raptors, and other species of management concern is intended to lay the foundation for the discussion of impacts for the Proposed Action and alternatives.

Big Game

Big game species present in the Project Area include mule deer, elk, pronghorn antelope, moose, black bear and mountain lion. Direct and indirect effects on big game species would occur during each project phase, but the magnitude of effects would vary depending on the type of activities, the species affected, and the seasonal sensitivity of the species and its habitat.

During the construction phase, the most important direct impact would be habitat loss due to construction of facilities. About 40 percent of the disturbed area would be reclaimed immediately, although revegetation may require several years. The other 60 percent of the affected area would be occupied by well pads, roads and other facilities, and would represent a long-term habitat loss. These losses would be partially replaced by habitat enhancement projects required by BLM for direct impacts on federal lands. Similar requirements may be applied on UDWR lands. No habitat enhancement projects would be on State Trust or private lands. These areas represent 38 to 70 percent of the surface disturbed areas of the seven alternatives.

Indirect impacts due to displacement would also occur during construction, and would adversely affect wildlife resident in the area during the construction period. Wintering big game would be unlikely to be affected because most (or all) of the construction would occur during the summer and fall, when wintering big game are not present in the Project Area.

During the operation phase, direct impacts from removal of habitat would continue, offset to some extent by enhancement of other habitat. In addition, because of the greatly

increased network of roads and increased RGC and public use of the road network, there would be increased mortality and injury from big game collisions with vehicles and from legal and illegal hunting. However, the most important impacts during operation would be the indirect effects from displacement and harassment of big game on critical and high value habitat during the critical season. This is described more fully below.

The abandonment phase would primarily have positive direct impacts, by removal and reclamation of facilities. Indirect impacts would be similar, but of lesser magnitude, to the construction phase.

The greatest impact to big game would likely be disturbance caused by increased human activity, equipment operation, vehicle traffic and noise. In this case habitat would not be physically altered in any way but affected by the presence of these activities. Big game animals would avoid or move away from these types of disturbance to other habitat areas. This avoidance is referred to as displacement and would result in underuse of habitat near the disturbance. The impact would be that the value of the habitat near the disturbance would be decreased and would not support the same level of big game use as long as the disturbance remained. Another impact associated with this avoidance or displacement would be alteration of natural distribution patterns, resulting in increased or concentrated use of other habitat areas. This would lead to overuse and degradation of habitats where big game are concentrated.

Displacement or loss of habitat value for big game has been documented by numerous researchers (Lyon 1985, Ward 1976, Ward et al. 1980, Rost and Bailey 1979). These researchers found that disturbance associated with human presence and traffic on roads reduces the use of habitat by big game adjacent to the activity. The distance big game move away from these activities ranges from 200 meters for deer to well over 800 meters for elk. The actual distance big game move to avoid vehicle traffic and other human disturbance is influenced by topography, presence of vegetation that may screen the disturbance and intensity of the disturbance. Avoidance is greatest along more heavily traveled secondary or dirt roads (Rost and Bailey 1979, Perry and Overly 1976). Other factors affecting road avoidance by big game include slower traffic speed, vehicles that stop, and traffic with associated out-of-vehicle activity. All of these factors are known to increase the distance big game move away and are typical of traffic associated with gas field activity.

Most species of big game are known to adapt to human related disturbances to some degree or another. For example, deer and pronghorn would adapt to heavy traffic associated with paved roads and characterized as constant speed with no-out-of-vehicle human activity (Ward et al. 1980, Ward 1976, Richardson 1992). Several factors influence the likelihood of big game populations to adapt to human related disturbances. Non-migratory and non-hunted populations of big game are more likely to adapt than migratory or hunted populations. Mule deer and elk populations in the CBM Project Area are migratory and are hunted immediately prior to their arrival on winter range in the Project Area. Based on these factors specific to the Project Area, big game are not expected to readily adapt to the human related disturbances associated with the gas field operation.

Displacement results in underuse of habitat near disturbances (loss of habitat value),

overcrowding on the remaining habitat, increased competition for space with other species, areas of overuse, and decreased physical condition of the population. Other effects of increased stress and harassment may include a reduction in reproduction rates, and increase in winter mortality due to increased energy use. Increased expenditures of energy could be particularly significant during severe winter conditions when mortality of fawns is high due to natural conditions. Displacement effects would result in reductions in carrying capacity; although the physical habitat would still be present, the animals would use it to a much lesser extent than before the disturbance. Loss of carrying capacity in turn may in turn result in long-term reductions in big game populations, especially if alternative habitat areas are unavailable or already occupied. Displacement is of greatest concern in areas which have been recognized as critical habitat, areas essential for the maintenance of the local populations. Displacement effects combined with increased direct mortality from vehicle collisions, and legal and illegal harvest could result in unit-wide reductions in populations.

The magnitude of displacement and actual reduced habitat value would vary depending on road use, traffic levels, topography, vegetative cover and slope. The analysis of displacement areas for big game follows a two-step approach, as described in Appendix 4B. This involves (1) mapping of displacement zones, and (2) assessment of effects on habitat value based on expected levels of human activity.

Raptors

Raptors nesting in or near the Project Area include golden eagle, Cooper's hawk, red-tailed hawk, ferruginous hawk, prairie falcon, peregrine falcon, American kestrel, Great horned owl, and burrowing owl.

During the construction phase, disturbance and stress associated with human activity in the vicinity of a raptor nest would cause indirect impacts, including nest abandonment or loss of young. Sensitivity varies by type of disturbance and species; for example, breeding ferruginous hawk are considered to be very sensitive, while red-tailed hawks are much less sensitive. Nesting birds would be more sensitive to disturbance in the line of sight from a nest (e.g., below a cliff nest) than to activities not in the line of sight.

The direct impact (destruction of active raptor nests or disturbance to nests resulting in disruption of the nesting cycle or mortality of young) is illegal under federal law and should not occur under any alternative. There would be no aboveground electrical transmission lines associated with the project, so electrocutions and power line collisions are not an issue.

The raptor prey base would be reduced by construction activities. Small mammal populations would be affected most, because of their limited mobility. Some animals would be destroyed during the construction phase, or displaced from their preferred habitat. Animals displaced due to physical habitat loss would be subject to a greatly increased chance of predation and would likely not survive.

Impacts during operation are likely to be less adverse. Raptors will adapt to human activities in varying degrees, and may even build nests near frequent non-threatening human activity, such as a road.

The abandonment and reclamation phase would have positive effects, from reduction of human activity.

Four environmental protection measures would help to limit indirect effects on nesting raptors. Environmental protection measure BLM 40 restricts well construction on federal land within one-half mile of any raptor nest active within the previous three years, unless site-specific evaluations indicate that there would be no adverse effects. Road and pipeline construction may occur after the seasonal closure. Protective windows established by BLM (USDI, BLM 1984a) for the raptor species in the Project Area include:

- Golden eagle - February 1 to June 15
- Cooper's hawk - April 15 to July 15
- Red-tailed hawk - February 15 to June 15
- Ferruginous hawk - March 15 to June 15
- Prairie falcon - March 15 to June 15
- American kestrel - April 15 to July 15
- Great horned owl - January 15 to May 1
- Burrowing owl - April 15 to July 15

Raptor nest locations on federal lands would be identified during annual raptor nest surveys (environmental protection measure BLM41). Annual monitoring would not be required on other lands, except potentially on UDWR lands.

For other, non-federal lands, RGC has committed to RGC 14, a seasonal (nesting season) limit on construction within one-half of raptor nests, unless not warranted by site conditions or regulation. This protection measure may not be effective without annual monitoring to identify nesting activity. In addition, UDOGM includes on its drilling permits a stipulation providing for seasonal (February 15 to July 15) restriction on drilling within one-half mile of nesting raptors, when requested by UDWR.

During the construction phase of the Price CBM Project, construction would normally not occur within one-half mile of active raptor nests during the active season, on both federal and non-federal lands. Exceptions would include nests where federal and/or state wildlife biologists have concluded a less restrictive measure would provide equivalent protection, and unknown active nests. On federal lands, construction of wells near active nests would not be allowed for three years, but road and pipeline construction could occur after the seasonal window. On non-federal lands, wells could be constructed after the end of the seasonal window, and those wells and the associated human activity would potentially displace breeding pairs to alternative nesting sites upon their return to the nesting territory in the following year.

Limited adverse impacts to raptors would be likely to result from operation. During this phase, it is likely that raptors would build new nests or reoccupy old nests within one-half mile of wells and roads. When raptors choose to nest in these locations, it is assumed that they are adapted and would not be adversely affected. Some raptors may be injured or killed in collisions with vehicles. The increased road network would provide much more public access, and illegal shooting could cause some losses of raptors. Impacts associated with abandonment and reclamation would be minor.

Other Species of Management Concern

White-tailed prairie dog complexes and non-game birds would be impacted from CBM development and operation, including the direct loss of prairie dog habitat and

associated ecological communities and direct loss of non-game bird nests and nesting habitat or displacement from nesting habitat.

4.7.2.1 Proposed Action

The Proposed Action would involve the construction of 601 wells, 350 miles of existing roads, and various other facilities over a six to ten year period. Direct (actual habitat loss) and indirect (displacement) impacts are summarized below.

Mule Deer

Construction. A summary of the direct effects on habitat is presented in Table 4.7-1, for the Proposed Action and each of the other alternatives. Construction of the wellpads, roads, pipelines and other facilities would involve disturbance or removal of existing vegetation within important mule deer habitats. This would include 1,341 acres of impact in mule deer critical winter range (2.5 percent of this habitat within the Project Area), and 1,191 acres of impact in mule deer high value winter range (2.3 percent). There would be no impacts to critical summer habitat. There would be large areas affected within limited value yearlong habitat, but impacts to this habitat is of low significance compared to other habitat types. Acres of impacts are provided in the tables, but are not discussed further in the text.

Although presented as one number in Table 4.7-1, construction impacts would be spread over 6 to 10 years, and construction within mule deer critical or high value winter habitat would probably occur in about two-thirds of the construction years. During the remaining years, it would be occurring in other portions of the Project Area. Within each year, about 40 percent of the area disturbed would be revegetated, and the remainder would be occupied by various facilities for the life of the project. The project-long total of areas occupied by operational facilities would be 754 acres in mule deer critical winter range (1.4 percent of available habitat in the Project Area), and 712 acres in high value winter range (also 1.4 percent).

Environmental protection measure BLM 38 requires that areas affected by construction on BLM land be mitigated by upgrading of adjacent habitat to allow for increased use by wildlife, in order to maintain the same carrying capacity for the overall habitat. Actual habitat enhancement projects would be identified from those described in the wildlife mitigation plan (Appendix 4C). Of the 1,341 acres of direct impact in mule deer critical winter range, 889 acres would be on federal lands, and would be compensated for by this environmental protection measure. This represents about 66 percent of the total area of critical winter range affected by construction. These habitat improvement projects would be subject to environmental review and compliance requirements, such as NEPA and cultural resource clearances.

Impacts to high value habitat would also be significant unless mitigated. BLM has developed a new mitigation as a result of the EIS process, which states: "Where disturbance exceeds 10 acres in elk or mule deer high value winter range, an equivalent acreage of adjacent habitat will be upgraded to accommodate increased use, and is to be completed commensurate with surface disturbing activity." Of the 1,191 acres of direct impact on mule deer high value winter range, 690 acres (58 percent) is on federal lands and would be compensated for by this mitigation.

Areas of direct effect on non-federal lands (452 acres of critical winter range and 501 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands represent 0.9 percent of the winter range in the herd unit and are considered significant.

Indirect (displacement) effects of construction on mule deer would likely be minor, because little construction would occur during critical wintering seasons. On BLM lands, environmental protection measure 37 requires that drilling and development only be done from May 16 to October 31 in winter range. It is RGC's intent to be completed with construction by the end of October at higher elevations. As a worst case, construction in those areas might extend to mid-December. For non-federal lands, UDOGM includes seasonal restrictions as a stipulation on their permits to drill when requested by UDWR; these stipulations state that construction should be restricted from December 1 to April 15.

Increases in mortality from collisions and increased legal and illegal hunting would be minor during construction, because few mule deer would be present in the Project Area during the seasonal construction window.

Operation. The operational period would last about 20 years for any one well. During this period, the facilities in place would continue to occupy mule deer critical and high value winter range. The project-long total of areas occupied by operational facilities would be 754 acres in mule deer critical winter range (1.4 percent of available habitat in the Project Area), and 712 acres in high value winter range (also 1.4 percent). This loss of habitat would be offset by increases in carrying capacity resulting from habitat improvement programs (see above).

Wintering mule deer would be subject to disturbance, stress, and displacement where key wintering habitats overlap with project facilities. At full operation (years 10 to 20), 205 production wells, 3 injection wells, 3 evaporation ponds, and one compressor station would be located in critical winter range; and 162 production wells, 1 injection well, 3 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads, there would be 112 miles of roads servicing gas field facilities in critical winter habitat, and 98 miles of roads in high value winter habitat. Some of these roads are currently existing but would be upgraded, and others would be new. Well field maintenance personnel would visit each well approximately once every three days, and roads would be kept clear of snow. The road network would be open to the public year-round except where gates were closed in winter, and is assumed to result in higher public use of the area.

Displacement of mule deer from project facilities was analyzed using a distance of 200 meters. This distance was selected as an average among ranges of displacement distance reported in the scientific literature (Ward et al. 1980, Rost and Bailey 1979), and was suggested by the UDWR (Moretti 1995). Because wells, compressors, and other facilities would all be adjacent to roads, displacement of mule deer from these facilities is assumed to fall within the 200 meter buffer. The total area of displacement would be 17,367 acres (32 percent of available habitat in the Project Area) in critical winter range; and 15,829 acres (31 percent) in high value winter range.

Winter road closure is included as part of the Proposed Action in order to reduce impacts to wintering big game. Where road closures could be implemented, habitat value within the displacement area would be increased, because of reductions in traffic volume and human presence. Although mule deer would be subject to the same displacement distance as in non-closed areas, they would have a reduced frequency of disturbance. Methods of estimating habitat value, including beneficial results of road closures, are presented in Appendix 4B. With closure of selected roads during winter, there would be 10,280 acres of reduced habitat value in critical winter range (19.1 percent of available habitat in the Project Area), and 11,135 acres of reduced habitat value in high value winter range (21.5 percent) (Table 4.7-2).

Reductions in habitat value would be likely to lead to reductions in local and management unit-wide mule deer populations. All of the proposed RGC facilities in critical and high value winter range would be located within the Northeast Manti herd unit. The critical and high value winter habitat within the Project Area represents about 71 percent of the 148,000 acres of winter range within this unit, including nearly all of its critical winter range. Critical winter range by definition is typically the range most limiting to the survival of a mule deer herd. This is true for the Northeast herd unit as this herd unit has ample summer range and very limited winter range. Because critical winter range is the limiting factor for the herd, effects to or losses of critical winter range directly affect population carrying capacity of the herd. This effect to population carrying capacity is assumed to be proportionate to the affected habitat. Based on this analysis, the mule deer carrying capacity in the Project Area would be reduced by 19 percent. Since about 95% of the critical winter range in the Northeast Manti herd lies within the Project Area (Bates 1996a), an 18 percent reduction in the carrying capacity of the Northeast Herd unit would be expected. This would mean that the target winter population for the Northeast herd unit would be reduced by 2,520 deer or from 14,000 to 11,480 (Table 4.7-3). The target buck harvest would be reduced by 252 bucks from 1400 to 1148. Although summer range would not be affected by the Proposed Action, populations of mule deer on summer ranges would also be reduced to the same degree. The mule deer population is currently much lower than the target, and the project therefore may not cause direct mortality of existing deer, but would limit future rebounds in population.

Displacement and population impacts can be reduced by implementing mitigations which reduce conflicting uses, such as acquisition of habitat or changes in livestock management to allocate more grazing to wildlife. Determining appropriate and reasonable mitigation to address impacts of disturbance/displacement on 21,415 acres of winter range is very difficult. However, BLM has developed and implemented a mitigation standard for this type of impact in a previous CBM gas field with similar habitat values within the Price River Resource Area. In that case, mutual agreement was reached between BLM, CBM company officials and UDWR that a one time payment of $750 per well (regardless of surface or mineral ownership) be made into an account established specifically for this purpose. This was considered reasonable to address disturbance/displacement impact to mule deer, elk, black bear and mountain lion in similar habitats. This agreement was reached in 1993.

A BLM mitigation measure developed for this project (Appendix 4C) requires: "The

proponent shall participate in a Wildlife Habitat Impact Mitigation Program similar to that developed for the Castlegate Coalbed Methane EIS and for the Helper Coalbed Methane Field. Participation shall involve entering into a cooperative agreement and providing a monetary contribution on a per well basis into a dedicated account managed by BLM and the Utah Division of Wildlife Resources." This mitigation would involve a one-time payment of $750 (1996 dollars) per well, both on federal and non-federal lands. Funds accumulated in this mitigation account would then be used to effect a change in surface management that would directly benefit big game, mountain lion, and black bear. Application of this mitigation would reduce the magnitude of indirect impacts to deer, but would not eliminate them.

Increased mortality would also be likely to occur during project operation, due to vehicle collisions, legal and illegal hunting, and harassment of mule deer. These would all be likely to increase because of the greatly expanded network of roads within critical and high value winter range, and because roads would be kept open (free of snow) during the winter. Both of these factors may lead to greatly expanded traffic volumes, but the magnitude of adverse effects on mule deer are difficult to predict.

The potential for collisions would be greatest during the winter months when big game is concentrated at lower elevations and days are short, and at night when visibility is reduced. The magnitude of impacts depends on traffic volume, vehicle speed, habitat openness and visibility, and driver awareness. The design speeds for the various road types are relatively low and may help to reduce the potential for collisions: 25 mph for collector roads, 20 mph for local roads, and 15 mph for resource roads. RGC would require its employees and contractors to maintain these speed limits (environmental protection measure RGC 12). This requirement may be difficult to enforce in the field, and non-RGC users would not be subject to it, but road conditions would be likely to limit excessive speed. RGC would also use a remote monitoring system which reduces the frequency of visits to wells. Gates would restrict public access during winter on about 60 percent of roads in critical winter range and 45 percent of roads in high value winter range, greatly reducing the potential for adverse effects from collisions in those areas.

The enlarged and improved road network would make the area more accessible to both legal and illegal hunting, and to deliberate and unintentional harassment, and would make detection of illegal hunting more difficult. According to UDWR (Gramlich 1996), current levels of illegal hunting appear to be low because of low mule deer populations, but poaching was much greater in the 1980s when numbers were higher. Unintentional disturbance of wildlife may occur from people stopping vehicles and getting out to watch wildlife. Harassment of wildlife, especially in winter, may lead to increased mortality through stress. The potential for hunting and harassment of wildlife by RGC personnel would be reduced by implementation of environmental protection measures RGC 10 (no firearms or pets for RGC employees and contractors while on the job), and RGC 11 (training of employees and contractors regarding wildlife protections). The potential for illegal hunting and harassment by non-RGC employees would be reduced by winter gate closures.

Abandonment and Reclamation. Activities associated with abandonment would be likely

to have minor direct and indirect impacts to mule deer, because the activities would be short in duration, involve small numbers of employees, and occur during the summer time when mule deer would mostly be at higher elevations and not under stress.

Following abandonment and reclamation, conditions in the Project Area would tend to return to pre-project conditions. Recovery of wildlife populations would be limited to the extent that roads constructed or improved for the project were maintained after the end of the project. Collector and local roads, and resource roads that were improved from pre-project roads would be likely to be kept.

Elk

Construction. A summary of the direct effects on elk habitat is presented in Table 4.7-4, for the Proposed Action and each of the other alternatives. Construction of the wellpads, roads, pipelines, and other facilities would involve disturbance or removal of existing vegetation within important elk habitats. There would include 808 acres of impact in elk critical winter range (2.6 percent of this habitat within the Project Area), and 1,651 acres of impact in elk high value winter range (2.4 percent). There would be no direct effects on critical summer or yearlong habitat. The project would also affect substantial value winter habitat, and a small amount of limited value winter habitat. Impacts on substantial value winter habitat and limited value yearlong habitat are presented in the summary tables, but are not discussed further in the text because of the lower significance compared to critical and high value habitat.

Although presented as one number, construction would be spread over 6 to 10 years, and impacts to elk critical or high value winter habitat would probably occur in about two-thirds of the construction years. During other years, construction would be occurring in other portions of the Project Area. Within each year, about 40 percent of the area disturbed would be revegetated, and the remainder would be occupied by various facilities for the life of the project. The project-long total of areas occupied by operational facilities is 476 acres in elk critical winter range (1.6 percent of available habitat in the Project Area), and 951 acres in high value winter range (1.4 percent).

Environmental protection measure BLM 38 requires that critical habitat affected by construction on BLM land be mitigated by upgrading of adjacent habitat to allow for increased use by wildlife, in order to maintain the same carrying capacity for the overall habitat. Of the 808 acres of direct impact in elk critical winter range, 73 acres are in lands with BLM surface ownership, and would be compensated for by this environmental protection measure. This represents about 46 percent of the total area of critical winter range affected by construction. Impacts to high value habitat on federal lands would be similarly mitigated, based on the BLM mitigation measure developed as a result of the EIS process, and discussed under mule deer. Of the 1,651 acres of direct impact on elk high value winter range, 1,140 acres (69 percent) would be on federal lands and would be compensated for by this mitigation. Areas of direct effect on non-federal lands (435 acres of critical winter range and 511 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands represent about 1.0 percent of the winter range in the Project Area, and are considered significant.

Indirect (displacement) effects of construction on elk would be minor, because little

construction would occur during critical wintering seasons. On BLM lands, environmental protection measure 37 requires that drilling and development only be done from May 16 to October 31 in critical winter range. It is RGC's intent to be completed with construction by the end of October at higher elevations. As a worst case, construction in those areas might extend to mid-December. For non-federal lands, UDOGM includes seasonal restrictions as a stipulation on their permits to drill when requested by UDWR; these stipulations state that construction should be restricted from December 1 to April 15.

Increases in mortality from collisions and increased legal and illegal hunting would also likely be minor during construction, because few elk would be present in the Project Area during the seasonal construction window.

Operation. The operational period would last about 20 years for any one well. During this period, the facilities in place would continue to occupy elk critical and high value winter range. The project-long total of areas occupied by operational facilities would be 476 acres in elk critical winter range (1.6 percent of available habitat in the Project Area), and 951 acres in high value winter range (1.4 percent). This loss of habitat would be offset to some extent by increases in carrying capacity resulting from habitat improvement programs (see above).

Wintering elk would be subject to disturbance, stress, and displacement where key wintering habitats overlap with project facilities. At full operation (years 10 to 20), 117 production wells, 1 injection wells, 1 evaporation pond, and two compressor stations would be located in critical winter range; and 241 production wells, 3 injection wells, 2 compressor stations and 3 evaporation ponds would be located in high value winter range. In addition to existing paved roads, there would be 68 miles of roads servicing gas field facilities in critical winter habitat, and 144 miles of roads in high value winter habitat. Some of these roads are currently existing but would be upgraded, and others would be new. Well field maintenance personnel would visit each well approximately once every three days, and roads would be kept clear of snow. The road network would be open to the public year-round except where gates are closed in winter, and would contribute to higher public use of the area.

Displacement of elk from project facilities was analyzed using a displacement distance of 800 meters. This distance was selected as an average among ranges of displacement distance reported in the scientific literature (Lyon 1985, Ward 1976, Ward et al. 1980, Ward 1985, Ward and Cupal 1979, Edge and Marcum 1985, Rost and Bailey 1979, and Irwin and Peek 1983), and was suggested by the UDWR (Moretti 1995). Because wells, compressors and other facilities would all be adjacent to roads, displacement of elk from these facilities is assumed to fall within the 800 meter buffer. The total area of displacement is 26,380 acres in critical winter range (87 percent of available habitat in the Project Area; and 52,988 acres in high value winter range (78 percent of available habitat). Elk would also be displaced from large portions of substantial value winter habitat, limited value winter habitat, and a small area of critical summer habitat.

Winter road closure is included as part of the Proposed Action in order to reduce impacts to wintering big game. Where road closures were implemented, decreases in habitat value

would likely be reduced, because of lower traffic volume and human presence. Although elk would be subject to the same displacement distance as in non-closed areas, they would have a reduced frequency of disturbance. The methods of estimating loss of habitat value are presented in Appendix 4B. There would be 10,815 acres of reduced habitat value in critical winter range (36 percent of available habitat in the Project Area), and 37,892 acres in high value winter range (56 percent) (Table 4.7-5). There would also be substantial reductions in habitat value on substantial value winter habitat and limited value winter habitat. Reductions in critical summer range would be minor, because only a small portion of critical summer range is located in the Project Area.

Reductions in habitat value would be likely to lead to reductions in local and management unit-wide elk populations and harvest. All of the proposed RGC facilities in critical and high value winter range would be located within the Manti herd unit. About 30 percent of the elk from this herd unit winter within the RGC Project Area, about 2,500 to 3,000 animals (Bates 1996a). Assuming that reductions in winter carrying capacity would be proportionate to loss of habitat value in critical winter habitat, the project would affect about 36 percent of the elk winter carrying capacity in the Project Area, and about 11 percent of winter carrying capacity in the entire herd unit. Assuming that overall population effects would be proportional to losses of critical winter range, this would result in an estimated reduction in the target Manti elk herd of 1,210 elk, and a reduction in the target bull harvest of 143 bulls (Table 4.7-6).

Displacement and population impacts can be reduced by implementing mitigations which reduce conflicting uses, such as acquisition of habitat or by changes in livestock management to allocate more grazing to wildlife. Funds provided by the Wildlife Habitat Impact Mitigation Program (described under mule deer and in Appendix 4C Wildlife Mitigation Plan) would reduce the magnitude of indirect impacts to elk, but would not eliminate them.

As with mule deer, increased mortality would be likely from vehicle collisions, hunting and harassment. A detailed discussion of these issues is provided under mule deer.

Abandonment and Reclamation. Activities associated with abandonment would be likely to have minor direct and indirect impacts to elk because the activities would be short in duration, involve small numbers of employees, and occur during the summer time when elk are mostly at higher elevations and are not under stress.

Following abandonment and reclamation, conditions in the Project Area would tend to return to pre-project conditions. Recovery of wildlife populations would be limited to the extent that roads constructed or improved for the project were maintained after the end of the project. Collector and local roads, and resource roads that were improved from pre-project roads, would be expected to be kept.

<u>Black Bear</u>

Construction. A summary of the direct effects on habitat is presented in Table 4.7-7, for the Proposed Action and each of the other alternatives. Construction of the wellpads, roads, pipelines and other facilities would involve disturbance or removal of existing vegetation within yearlong high value black bear habitat: 566 acres of direct impact (2.1 percent of the habitat within the Project Area.

Construction would be spread over 6 to 10 years, but impacts to black bear habitat would probably occur in about one-third of the construction years. Avoidance of streams and associated riparian areas (environmental protection measure BLM 4) would reduce potential impacts.

Construction would occur during summer and early fall months, when black bears are active, and black bears would likely be displaced from construction areas. Applying the same displacement distances for bear as for elk (800 meters), bear would be displaced from 22,330 acres (84 percent of their habitat in the Project Area) at some point during construction (Table 4.7-8).

Operation. The operational period would last about 20 years for any one well. During this period, the facilities in place would continue to occupy black bear high value yearlong habitat. The project-long total of areas occupied by operational facilities would be 331 acres (1.2 percent of available habitat in the Project Area).

Black bear would continue to be subject to disturbance, stress, and displacement from human activities associated with facilities located within their habitat. At full operation (years 10 to 20), 65 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in bear habitat. In addition to existing roads, there would be 48 miles of roads to CBM field facilities within black bear habitat. Assuming an 800 meter displacement distance, black bear would be eliminated from about 84 percent of the Project Area, and would continue to be present only if animals were able to adapt to the increased level of human activity. However, considering the typically dispersed and low density occurrence of black bear, adverse impacts to regional black bear populations would likely be minor.

Abandonment and Reclamation. Activities associated with abandonment would be likely to have minor direct and indirect impacts to black bear. Following abandonment and reclamation, conditions in the Project Area would tend to return to pre-project conditions, and bear populations may return.

<u>Mountain Lion</u>

Construction. For analysis, mountain lion habitat is assumed to be the same as mule deer habitat, and direct impacts to habitat would be the same. Direct impacts to mountain lions would be minor during construction, because destruction of a breeding den or mortality from a vehicle collision would be unlikely. Indirect impacts may occur to resident mountain lions during construction, and result in displacement of mountain lions from areas within 800 meters of construction. However, mountain lion populations would be likely to be lower in the Project Area during the construction season when deer and elk are at higher elevations, compared to the winter when prey animals are concentrated on their winter habitat.

Operation. Direct impact to mountain lion habitat during the operational period would be the same as for mule deer. Indirect impacts would be significant. Mountain lion are more sensitive to human disturbance than deer. Assuming an 800-meter displacement distance (similar to elk), mountain lion would be displaced from about 78 percent (82,700 acres) of mule deer critical and high value winter habitat. This could result in a proportionate decrease in the mountain lion harvest from 6 to 1. Winter road closure may reduce this impact, but habitat fragmentation and reduction in the deer and elk herds may

eliminate mountain lion from all but the most rugged portions of the affected area.

Abandonment and Reclamation. Activities associated with abandonment would be likely to have only minor direct or indirect impacts. Following reclamation, conditions in the Project Area would tend to return to pre-project conditions, and mountain lion populations should recover.

Pronghorn Antelope

Construction. A summary of the direct effects on habitat is presented in Table 4.7-9, for the Proposed Action and each of the other alternatives. Construction of the wellpads, roads, pipelines and other facilities would involve disturbance or removal of 871 acres of existing vegetation within antelope high value yearlong habitat (1.8 percent of habitat available in the Project Area), and 649 acres of potential antelope habitat (1.0 percent). Impacts to antelope would probably occur in about half of the construction years.

Pronghorn antelope exhibit high levels of adaptability to human disturbance and have been found to adapt to increased traffic volumes (Reeve 1984, Ward et al. 1980). Based on these studies, displacement of antelope during construction was analyzed using a displacement distance of 100 meters from roads. Displacement from other facilities is assumed to fall within the 100 meter buffer. Antelope would be displaced from 6,088 acres of high value yearlong habitat (12 percent of that type available in the Project Area) (Table 4.7-10).

Increases in mortality from collisions and increased legal and illegal hunting would likely be minor during construction, because there are already numerous roads within pronghorn habitat in the Project Area.

Operation. The operational period would last about 20 years for any one well. During this period, the facilities in place would continue to occupy pronghorn habitat. The project-long total of areas occupied by operational facilities would be 511 acres in pronghorn high value yearlong range (1.0 percent of available habitat in the Project Area), and 349 acres in potential habitat (1.2 percent).

Displacement effects would continue during operation, but pronghorn may adapt to project facilities and routine human activities within yearlong high value habitat. At full operation (years 10 to 20), 147 production wells and 76 miles of new or improved roads would be located in high value winter habitat. Displacement effects may limit expansion of antelope populations into the potential habitat west of Highway 10; project facilities planned for that area include 81 wells, 3 evaporation ponds, 3 injection wells, and 1 compressor station, along with 79 existing wells. Displacement effects would be unlikely to have significant adverse effects on antelope populations, because less than 1 percent of habitat available within the herd unit would be affected. In addition, no critical habitat would be affected.

The enlarged and improved road network would make the area more accessible to both legal and illegal hunting, and to deliberate and unintentional harassment. The potential for hunting and harassment of wildlife by RGC personnel would be reduced by implementation of environmental protection measures RGC 10 (no firearms or pets for RGC employees and contractors while on the job), and RGC 11, training of employees and contractors regarding wildlife protections.

Abandonment and Reclamation. Activities associated with abandonment would be likely

to have minor direct and indirect impacts to antelope, because the activities would be short in duration and involve small numbers of employees.

Following abandonment and reclamation, conditions in the Project Area would tend to return to pre-project conditions. Recovery of wildlife populations would be limited to the extent that roads constructed or improved for the project were maintained after the end of the project. Collector, local, and resource roads that were improved from pre-project roads would be expected to be kept.

Moose

Construction. Construction of the wellpads, roads, pipelines and other facilities would involve disturbance or removal of existing vegetation on 356 acres in moose limited value winter range (1.8 percent of this habitat within the Project Area) (Table 4.7-11). Construction would be spread over 6 to 10 years, but most of the impacts to moose habitat would occur in 1 to 3 construction years; during other years, construction would be occurring in other portions of the Project Area. Avoidance of streams and associated riparian areas (environmental protection measure BLM 4) would reduce potential impacts.

Indirect (displacement) effects of construction on moose would likely be minor, because little construction would occur during winter. Increases in mortality from collisions and increased legal and illegal hunting would also likely be minor during construction, because few mule deer would be present in the Project Area during the seasonal construction window.

Operation. The operational period would last about 20 years for any one well. During this period, the facilities in place would continue to occupy moose limited value winter habitat. The project-long total of areas occupied by operational facilities would be 213 acres in moose habitat (1.1 percent of available habitat in the Project Area).

Wintering moose may be subject to disturbance, stress, and displacement where wintering habitats overlap with project facilities. At full operation (years 10 to 20), 41 production wells, 1 injection well, 1 evaporation pond, and one compressor station would be located in moose limited value winter habitat. There would also be 30 miles of new or upgraded roads to CBM field facilities. Assuming a displacement distance of 800 meters, the total area of displacement would be 15,751 acres (78 percent of available habitat in the Project Area) (Table 4.7-12). With winter road closure, the area of reduced habitat value would be reduced to 12,209 acres (60 percent of habitat available in the Project Area). These changes would be unlikely to have adverse effects on moose populations, because the affected habitat is of limited value.

Minor amounts of increased mortality may occur, from collisions, illegal and legal hunting, and harassment.

Abandonment and Reclamation. Activities associated with abandonment would be likely to have minor direct and indirect impacts to moose, because the activities would be short in duration, involve small numbers of employees, and occur during the summer time when moose are mostly at higher elevations and are not under stress.

Raptors

Construction. Twenty-eight raptor nests are known to have been active in the Project Area

from 1993 to 1995. Thirteen of these are within one-half mile of proposed facilities, including 9 golden eagle nests, 2 hawk (buteo) nests, 1 Cooper's hawk nest, and 1 historic golden eagle nest used by prairie falcons during 1993-1995. Twenty-two proposed wells would be within one-half mile of a recently active raptor nest, including 16 on federal lands, 4 on UDWR land, and 2 on state land. About 12 miles of transportation corridor would be within buffer zones of recently active raptor nests, including about 9.5 miles on federal land and 1.5 on UDWR land.

The 16 wells on BLM land would be subject to environmental protection measure BLM 40, which would restrict development of those wells. These wells could be developed if raptor nests were not used for a period of three years, which would indicate that the nests had been abandoned. This analysis represents wells and roads subject to restrictions based on current conditions (1993 to 1995 activity), and the locations and number of restricted wells would be likely to vary by the time of construction. The roads on BLM land and the wells and transportation corridors on other lands would be subject to seasonal restrictions on construction, which would delay construction until after nesting. Therefore, no direct or indirect disturbance would be likely from activities on federal lands for these nests during the year of construction. Some pairs could potentially be displaced in the following year, because of the presence of new facilities and the human activity associated with them. Nine of the raptor nests would be protected by BLM environmental protection measures, but four of them may be affected by facilities on non-federal lands.

Operation. Some species may adapt to gas field activities, and re-occupy old nests or build new nests near CBM project facilities. Raptors may be subject to increased stress, disturbance and harassment from general increases in human activity resulting from the improved and expanded road system and well maintenance and operation. This would be particularly true on non-federal lands where raptors would not be provided protection from maintenance and operation activities. Harassment by RGC employees and contractors would be reduced, with implementation of a wildlife protection training program (environmental protection measure RGC 11).

Abandonment and Reclamation. Activities associated with this phase would have minimal impacts on raptors. Raptors may continue to be subject to increased stress and harassment, compared to pre-project conditions, depending on how much of the road system were maintained by landowners after abandonment.

<u>Sage Grouse</u>

Aerial surveys over all potential sage grouse habitat within the Price CBM Project Area (i.e., Porphyry, Consumers, Horse and Telephone Benches) revealed no sign of sage grouse or sage grouse strutting grounds (MDG 1995a). Subsequent consultation with BLM (Mills 1995) and UDWR (Bates 1994) biologists determined that Porphyry, Consumers, Horse and Telephone Benches would be considered clear from current activity of breeding sage grouse and sage grouse strutting grounds. However, historic lek sites have been documented on Telephone Bench and may occur elsewhere in the Project Area.

Under current conditions, no adverse impacts to sage grouse strutting grounds or nesting habitat would occur from the Proposed Action. However, the presence of CBM facilities and human activity could prevent or delay re-establishment of sage grouse in the Project Area, if regional populations increase.

White-tailed Prairie Dog Complexes

Approximately 7,094 acres of white-tailed prairie dogs occur within the Price River CBM Project Area. Numerous federal and state threatened, endangered and sensitive species are grassland/shrubland ecosystems species, particularly associated with the presence of prairie dogs. The white-tailed prairie dog complexes in the Price area provide potential prey and year-long habitat for the endangered black-footed ferret, nesting habitat for burrowing owls, and prey for ferruginous hawks. Disturbance to prairie dog complexes under the Proposed Action has the potential to directly disturb individual prairie dog mounds, particularly during road and well construction phases. However, prairie dogs tend to be associated with disturbance such as livestock, water development and homesites (Knowles 1986, Fitzgerald et al. 1994) and may expand into disturbed areas during dispersal movements. Lightly traveled roads could also provide preferable foraging habitat for burrowing owls (See Section 4.8) and provide additional road-killed carrion for raptors such as wintering bald eagles and breeding golden eagles and ferruginous hawks. However, these birds would also be exposed to an increased potential for vehicle collisions. Stationary structures may also provide hunting perched for golden eagles, ferruginous hawks and other buteo species that prefer to hunt from elevated perches (Brown and Amadon 1968). Overall, short-term community impacts from construction activities in prairie dog complexes would be offset by long-term beneficial impacts of increased distribution of prairie dog complexes, and increased foraging habitat for owls, hawks and eagles.

Song Birds

Impacts to non-game birds resulting from the Proposed Action would consist of direct mortality from increased human activity and traffic, and habitat loss. Indirect impacts would consist of displacement from nesting habitat. Short-term direct loss of individuals and nest sites would occur in all habitat types during any construction activities occurring during the breeding season. Long-term loss of habitat and displacement of birds from breeding habitat would also occur in areas with semi-permanent wells, roads and facilities, and high human activity. However, considering the relatively small geographic area of these disturbances and the total amount of available habitat within the Project Area, these impacts are not considered significant.

4.7.2.2 Alternative A

Impacts under Alternative A would be similar to those described for the Proposed Action; however, the magnitude of the impacts under Alternative A would be greater than the Proposed Action because of the increased number and density of wells and roads. Impacts are discussed below for mule deer, elk, black bear, mountain lion, antelope, moose, and raptors. Impacts to sage grouse, white-tailed prairie dog complexes, and songbirds would be the same as those already discussed under the Proposed Action, except for the greater magnitude. The analysis below only describes differences between Alternative A and the Proposed Action.

Mule Deer

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Impacts would be increased because of the increased well density and number of facilities.

Direct impacts on habitat from construction would be increased by 37 percent (to 1,834 acres) for critical winter habitat and by 27 percent (to 1,508 acres) for high value winter habitat (Table 4.7-1). About 1,206 acres (66 percent) of the construction impacts in critical winter habitat and 904 acres (60 percent) in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (628 acres of critical winter range and 604 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands would represent 1.2 percent of the winter range in the herd unit and are considered significant.

Areas occupied by operational facilities would increase by 51 percent in critical winter range (to 1,142 acres), and by 31 percent in high value winter range (to 943 acres). At full operation (years 10 to 20), 357 production wells, 3 injection wells, 3 evaporation ponds, and one compressor station would be located in critical winter range; and 265 production wells, 1 injection well, 3 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads, there would be about 147 miles of roads servicing gas field facilities in critical winter habitat, and 129 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be 22,162 acres in critical winter habitat (41 percent of that type in the Project Area), and 18,682 acres (36 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 13,027 acres in critical winter range (24 percent of available habitat in the Project Area), and 13,368 acres in high value winter range (26 percent) (Table 4.7-2). Increases in mortality from vehicle collisions and legal and illegal hunting would likely be greater than would the Proposed Action, because of the larger road network.

All of the RGC facilities in critical and high value winter range would be located within the Northeast Manti herd unit. Using the same assumptions as for the Proposed Action, the loss of 24 percent of winter range carrying capacity would lead to a reduction in the target Northeast Manti deer herd of 3,220 deer, and a reduction in the target buck harvest of 332 bucks (Table 4.7-3). The mule deer population is currently much lower than the target, and the project therefore may not cause direct mortality of existing deer, but would limit future rebounds in population.

Elk

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Impacts would be increased because of the increased well density and number of facilities.

Direct impacts of construction would be increased by 25 percent (to 1,020 acres) for critical winter habitat and by 33 percent (to 2,196 acres) for high value winter habitat (Table 4.7-4). About 479 acres (47 percent) of

the construction impacts to critical winter habitat and 1,527 acres (70 percent) in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (541 acres of critical winter range and 669 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands would represent about 1.2 percent of the winter range in the Project Area.

Areas occupied by operational facilities would increase by 32 percent in critical winter range (to 620 acres), and by 45 percent in high value winter range (to 1,381 acres). At full operation, 183 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in critical winter range; and 413 production wells, 3 injection wells, 2 compressor stations and 3 evaporation ponds would be located in high value winter range. In addition to existing paved roads, there would be about 84 miles of roads servicing gas field facilities in critical winter habitat, and 182 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be 26,425 acres in critical winter habitat (87 percent of that type in the Project Area), and 54,352 acres (80 percent) in high value winter range). Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 10,828 acres in critical winter range (36 percent of available habitat in the Project Area), and 38,502 acres of in high value winter range (57 percent) (Table 4.7-4). Increases in mortality from vehicle collisions and legal and illegal hunting would likely be greater than would the Proposed Action.

All of the RGC facilities in critical and high value winter range would be located within the Manti elk herd unit. Using the same assumptions as for the Proposed Action, the loss of 11 percent of winter range carrying capacity in the Manti herd unit would lead to a reduction in the target herd size of 1,210 elk, and a reduction in the target bull harvest of 143 bulls (Table 4.7-6).

<u>**Black Bear**</u>

With Alternative A, the types of impacts would be the same as for the Proposed Action. The area of affect for direct impacts would be increased, but the area of indirect impacts would be about the same (Tables 4.7-7 and 4.7-8). The area of construction impacts would be increased about 19 percent to 673 acres, and the area of operational facilities increased about 23 percent to 408 acres. Construction would occur during summer and early fall months, when black bears are active, and black bears would likely be displaced during construction and operation of the facilities. At an estimated displacement distance of 800 meters, bear would be displaced from 22,351 acres, 84 percent of their habitat in the Project Area. At full operation (years 10 to 20), 114 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in bear habitat. In addition to existing roads, there would be 55 miles of roads to CBM field facilities within black bear habitat. Black bear could be eliminated from the Project Area, and would continue to be present only if animals were able to adapt to the increased level of human activity. However, considering the typically dispersed and low density occurrence of black bear, adverse impacts to regional black bear populations would likely be minor and non-significant.

Mountain Lion

Impacts under Alternative A would be similar to those described for the Proposed Action. A larger area would be directly affected, as described for mule deer. Although there would be an increased density of wells and roads, the area of displacement would be about the same as with the Proposed Action. Mountain lion could be displaced from about 80 percent (84,200 acres) of habitat, and result in a proportionate decrease in the mountain lion harvest, from 6 to 1.

Pronghorn Antelope

The types of impacts to pronghorn antelope would be similar to the Proposed Action, and the same environmental protection measures would apply. Impacts would be increased because of the greater density of wells and roads. The analysis below only describes differences between Alternative A and the Proposed Action.

Direct impacts from construction would be increased by 46 percent (to 1,276 acres) within antelope high value yearlong habitat (2.6 percent of habitat available in the Project Area), and by 67 percent to 1,084 acres of potential antelope habitat (3.7 percent) (Table 4.7-9). Based on a displacement distance of 100 meters, antelope would be displaced from 8,284 acres of high value yearlong habitat during construction (16.9 percent of that available in the Project Area) (Table 4.7-10). Although antelope do not currently occur west of Highway 10, noise and disturbance would make 6,741 acres (13.9 percent) of potential habitat unsuitable for future occupancy.

The area occupied by operational facilities would also increase substantially, to 802 acres in high value yearlong habitat, and 655 acres in potential yearlong habitat. Displacement effects would continue during operation, although some habituation may occur which would reduce the area of effect. At full operation (years 10 to 20), 273 production wells and 104 miles of new or improved roads would be located in high value winter habitat. Direct disturbance of vegetation and displacement effects may limit expansion of antelope populations into the potential habitat west of Highway 10; project facilities planned for that area include 200 wells, 3 evaporation ponds, 3 injection wells, 1 compressor station, and 83 miles of new or improved roads, along with 79 existing wells. Although displacement effects would likely result in decreased use of the Project Area by antelope, they would be unlikely to have significant adverse effects on overall antelope populations even at full development, because less than 1 percent of habitat available within the herd unit would be affected, and no critical habitat would be affected. Some increases in hunting and harassment would be likely to occur, and may also reduce the number of antelope in the Project Area.

Moose

The types and magnitude of impacts to moose would be about the same as for the Proposed Action (Tables 4.7-11 and 4.7-12). Direct impacts would be slightly greater due to the increased well density, and there would be more facilities (wells and roads) located in moose habitat, but the area of indirect impacts would be the same. Construction of the wellpads, roads, pipelines and other facilities would involve disturbance or removal of existing vegetation on 407 acres in moose limited value winter range (2.0 percent of this habitat within the Project Area). The project-long total of areas occupied by operational facilities would be 250 acres in moose habitat (1.2 percent of available habitat in the Project

Area). At full operation (years 10 to 20), 63 production wells, 1 injection well, 1 evaporation pond, and one compressor station would be located in moose limited value winter habitat. There would also be 34 miles of new or upgraded roads to CBM field facilities. Assuming a displacement distance of 800 meters, the total area of displacement would be 15,771 acres (78 percent of available habitat in the Project Area). With winter road closure, the area of reduced habitat value would be reduced to 12,199 acres (60 percent of habitat available in the Project Area). These changes would be unlikely to have adverse effects on moose populations, because the affected habitat is of limited value.

Raptors

Under Alternative A, two additional raptor nests would be within one-half mile of project facilities than with the Proposed Action.

The types of impacts and applicable environmental protection measures would be the same as for the Proposed Action.

Fifteen raptor nests active between 1993 and 1995 would be within one-half mile of facilities, including 10 golden eagle nests, 2 buteo nests, 1 Cooper's hawk nest, and 2 historic golden eagle nest used by prairie falcons during 1993-1995. Forty-two new wells would be within one-half mile of a recently active raptor nest, including 26 on federal lands, 7 on UDWR land, 5 on state land, and 4 on private land. About 19 miles of transportation corridor would be within buffer zones of recently active raptor nests, including about 12 miles on federal land and 2 on UDWR land. Eight of the raptor nests would be protected by BLM environmental protection measures, but seven of them may be affected by facilities on non-federal lands.

4.7.2.3 Alternative B1

Alternative B1 would preclude CBM well development in the federal mineral estate within the combined deer and elk critical winter range under the 160 acre well spacing scenario (Section 2.4.1).

Impacts under Alternative B1 would be similar to those described for the Proposed Action. However, the magnitude of the impacts under this alternative would be reduced from the Proposed Action because of the decreased number and density of wells. The magnitude of potential adverse impacts would generally decrease in proportion to the decrease in well density and miles of transportation corridor. The location of facilities would also be modified because development would be restricted in a large area west of Price, which would further reduce impacts for some species. Impacts are discussed below for mule deer, elk, black bear, mountain lion, antelope, moose, and raptors. Impacts to sage grouse, white-tailed prairie dog complexes, and songbirds would be the same as those already discussed under the Proposed Action, except for the greater magnitude. In addition, this alternative would have a reduced potential for preventing re-establishment of sage grouse because historic habitat on Telephone and Horse Bench would not be developed. The analysis below only describes differences between Alternative B1 and the Proposed Action.

Mule Deer

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Although deer and elk critical winter habitat on federal land would be restricted from development, a substantial area of effect would still occur because of transportation

corridors through federal lands and CBM project development on BLM high value winter habitat, and in critical and high value habitat on state, UDWR, and private lands.

Direct impacts on habitat from construction would be decreased by 60 percent (to 536 acres) for critical winter habitat and by 12 percent (to 1,051 acres) for high value winter habitat (Table 4.7-1). About 131 acres (24 percent) of the construction impacts in critical winter habitat and 581 acres (55 percent) in high value habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (405 acres of critical winter range and 470 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands would represent 0.8 percent of the winter range in the herd unit.

Areas occupied by operational facilities would decrease by 62 percent in critical winter range (to 288 acres), and by 11.5 percent in high value winter range (to 630 acres). At full operation (years 10 to 20), 78 production wells, 1 injection well, 1 evaporation pond, and one compressor station would be located in critical winter range; and 146 production wells, 1 injection well, 3 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads, there would be about 41 miles of roads servicing gas field facilities in critical winter habitat, and 94 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be 6,585 acres in critical winter habitat (12 percent of that type in the Project Area), and 13,988 acres (27 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 4,680 acres in critical winter range (9 percent of available habitat in the Project Area), and 10,590 acres in high value winter range (20 percent) (Table 4.7-2). Increases in mortality from vehicle collisions and legal and illegal hunting would be smaller than with the Proposed Action, because of the smaller road network and avoidance of much of the critical winter habitat.

All of the RGC facilities in critical and high value winter range would be located within the Northeast Manti herd unit. Using the same assumptions as for the Proposed Action, the loss of 8 percent of the winter range carrying capacity would lead to a reduction in the target Northeast Manti deer herd of 1,120 deer, and a reduction in the target buck harvest of 112 bucks (Table 4.7-3). The mule deer population is currently much lower than the target, and the project therefore may not cause direct mortality of existing deer, but would limit future rebounds in population.

Elk

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Although deer and elk critical winter habitat on federal land would be restricted from development, a substantial area of effect would still occur, because of development in other areas and from transportation corridors on federal lands.

Direct impacts on habitat from construction would be decreased by 33 percent (to 539 acres) for critical winter habitat and by 41 percent (to 974 acres) for high value winter habitat (Table 4.7-4). About 151 acres (28 percent) of the construction impacts in critical

winter range and 496 acres (51 percent) in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (388 acres of critical winter range and 478 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands would represent about 0.9 percent of the winter range in the Project Area.

Areas occupied by operational facilities would decrease by 35 percent in critical winter range (to 311 acres), and by 40 percent in high value winter range (to 565 acres). At full operation, 68 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in critical winter range; and 125 production wells, 1 injection well, 2 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads, there would be about 44 miles of roads servicing gas field facilities in critical winter habitat, and 84 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be 20,050 acres in critical winter habitat (66 percent of that type in the Project Area), and 35,859 acres (53 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 9,662 acres in critical winter range (32 percent of available habitat in the Project Area), and 29,288 acres in high value winter range (43 percent) (Table 4.7-5). Increases in mortality from vehicle collisions and legal and illegal hunting would likely be much less than would the Proposed Action.

All of the RGC facilities in critical and high value winter range would be located within the Manti elk herd unit. Using the same assumptions as for the Proposed Action, the loss of 10 percent of winter range carrying capacity would lead to a reduction in the target Manti elk herd of 1,100 elk, and a reduction in the target buck harvest of 130 bulls (Table 4.7-6).

Black Bear

With Alternative B1, the types of impacts would be the same as for the Proposed Action, but the area of effect would be greatly reduced (Tables 4.7-7 and 4.7-8). About two-thirds of bear habitat in the Project Area would be located within the critical area where development on BLM lands would be restricted. The area of construction impacts would be decreased about 24 percent to 430 acres, and the area of operational facilities decreased about 25 percent to 248 acres. The area of indirect impacts would be reduced about 21 percent, to 17,704 acres (67 percent of black bear habitat in the Project Area). At full operation (years 10 to 20), 53 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in bear habitat. In addition to existing roads, there would be 35 miles of roads to CBM field facilities within black bear habitat. With two-thirds of its habitat potentially affected, black bear could be eliminated from the Project Area, and would continue to be present only if animals were able to adapt to the increased level of human activity. However, considering the typically dispersed and low density occurrence of black bear, adverse impacts to regional black bear populations would likely be minor and non-significant.

Mountain Lion

Impacts under Alternative B1 would be similar in type but reduced in scale from those described for the Proposed Action. Development would be restricted on federal lands within critical elk and deer winter range, which would provide secure areas for mountain lions and help to maintain them in the Project Area. Mountain lion could be displaced from about 56 percent (59,000 acres) of habitat, and result in a proportionate decrease in the mountain lion harvest, from 6 to 3. In addition, a smaller area would be directly affected, as described for mule deer.

Pronghorn Antelope

The types of impacts to pronghorn antelope would be similar to the Proposed Action, and the same environmental protection measures would apply. In addition, the area of direct and indirect impacts would be almost identical to the Proposed Action (Tables 4.7-9 and 4.7-10). The restrictions on development in the mule deer and elk critical habitat would have almost no effect on development in pronghorn habitat.

Moose

The types of impacts to moose for Alternative B1 would be the same as for the Proposed Action, but the area affected would be reduced in size by about 8 to 15 percent (Tables 4.7-11 and 4.7-12). The critical area addressed in this alternative covers about half of the moose winter habitat. Construction of the wellpads, roads, pipelines, and other facilities would involve disturbance or removal of existing vegetation on 297 acres in moose limited value winter range (1.5 percent of this habitat within the Project Area). The project-long total of areas occupied by operational. facilities would be 176 acres in moose habitat (0.9 percent of available habitat in the Project Area). At full operation (years 10 to 20), 30 production wells, 1 injection well, 1 evaporation pond, and one compressor station would be located in moose limited value winter habitat. There would also be 25 miles of new or upgraded roads to CBM field facilities. Assuming a displacement distance of 800 meters, the total area of displacement would be 13,619 acres (67.7 percent of available habitat in the Project Area). With winter road closure, the area of reduced habitat value would be reduced to 11,143 acres (55 percent of habitat available in the Project Area). These changes would be unlikely to have adverse effects on moose populations, because the affected habitat is of limited value.

Raptors

Under Alternative B1, most of the BLM lands in the northwest quarter of the Project Area would be restricted from development. Since most active raptor nests are in this area, this alternative would have much lower conflicts with raptors than the Proposed Action. Only four raptor nests would be within one-half mile of project facilities, compared to 13 for the Proposed Action, and a relatively small number of wells and roads would be located within buffer zones of recently active raptor nests. The types of impacts and applicable environmental protection measures would be the same as for the Proposed Action.

Four raptor nests active between 1993 and 1995 would be within one-half mile of facilities, including 2 golden eagle nests, 1 buteo nest, and 1 Copper's hawk nest. Seven new wells would be within one-half mile of a recently active raptor nest, including 1 on federal lands, 4 on UDWR land, and 2 on state land. About 3 miles of transportation corridor

would be within buffer zones of recently active raptor nests, including about 1 miles on federal land and 1.5 miles on UDWR land. All four active raptor nests may be affected by facilities on non-federal lands.

4.7.2.4 Alternative B2

Alternative B2 would preclude CBM well development in the federal mineral estate within the combined deer and elk critical winter range under the 80 acre well spacing scenario (Section 2.4.2).

Impacts under Alternative B2 would be similar to those described for the Proposed Action. The magnitude of the impacts under this alternative would be variously greater or less than the Proposed Action depending on the distribution of animal habitats relative to the areas closed to development. Impacts are discussed below for mule deer, elk, black bear, mountain lion, antelope, moose, and raptors. Impacts to sage grouse, white-tailed prairie dog complexes, and songbirds would be the same as those already discussed under the Proposed Action, except for the greater magnitude and restriction of development in critical habitat. In addition, this alternative would have a reduced potential for preventing re-establishment of sage grouse because historic habitat on Telephone and Horse Bench would not be developed. The analysis below only describes differences between Alternative B1 and the Proposed Action.

Mule Deer

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Although deer and elk critical winter habitat on federal land would be restricted from development a substantial area of effect would still occur because of transportation corridors through critical winter habitat on federal lands, and CBM project development on BLM high value winter habitat, and in critical and high value habitat on state, UDWR, and private lands. In addition, the density of wells would increase.

Direct impacts on habitat from construction would be decreased by 44 percent (to 758 acres) for critical winter habitat and would be increased by 13 percent (to 1,346 acres) for high value winter habitat (Table 4.7-1). About 164 acres (22 percent) of the construction impacts in critical winter habitat and 768 acres (57 percent) in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (594 acres of critical winter range and 578 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands would represent 1.1 percent of the winter range in the herd unit.

Areas occupied by operational facilities would decrease by 42 percent in critical winter range (to 439 acres), and would increase by 18 percent in high value winter range (to 840 acres). At full operation (years 10 to 20), 119 production wells, 2 injection wells, 2 evaporation ponds, and one compressor station would be located in critical winter range; and 230 production wells, 1 injection well, 3 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads, there would be about 58 miles of roads servicing gas field facilities in critical winter habitat, and 114 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be 9,034 acres in critical winter habitat

(17 percent of that type in the Project Area), and 16,697 acres (32 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 6,204 acres in critical winter range (12 percent of available habitat in the Project Area), and 12,780 acres in high value winter range (25 percent) (Table 4.7-2). Increases in mortality from vehicle collisions and legal and illegal hunting would be smaller than with the Proposed Action, because of the smaller road network and avoidance of much of the critical winter habitat.

All of the RGC facilities in critical and high value winter range would be located within the Northeast Manti herd unit. Using the same assumptions as for the Proposed Action, the loss of 11 percent of the winter range carrying capacity would lead to a reduction in the target Northeast Manti deer herd of 1,540 deer, and a reduction in the target buck harvest of 154 bucks (Table 4.7-3). The mule deer population is currently much lower than the target, and the project therefore may not cause direct mortality of existing deer, but would limit future rebounds in population.

Elk

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Although deer and elk critical winter habitat on BLM land would be restricted from development, a substantial area of effect would still occur because of development in other areas, and because the density of wells and other facilities would increase.

Direct impacts on habitat from construction would be decreased by 13 percent (to 706 acres) for critical winter habitat and by 23 percent (to 1,274 acres) for high value winter habitat (Table 4.7-4). About 191 acres (27 percent) of the construction impacts in critical winter range and 641 acres (50 percent) in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (515 acres of critical winter range and 633 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands represent about 1.2 percent of the winter range in the Project Area.

Areas occupied by operational facilities would decrease by 9 percent in critical winter range (to 431 acres), and by 19 percent in high value winter range (to 771 acres). At full operation, 115 production wells, 2 injection wells, 1 evaporation pond, and two compressor stations would be located in critical winter range; and 211 production wells, 1 injection well, 2 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads, there would be about 55 miles of roads servicing gas field facilities in critical winter habitat, and 107 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be 21,028 acres in critical winter habitat (69 percent of that type in the Project Area), and 39,653 acres (58 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 10,087 acres in critical winter range (33 percent of available habitat in the Project Area), and 31,370 acres of reduced habitat value in high value winter range (46 percent) (Table 4.7-5). Increases in mortality from vehicle collisions

and legal and illegal hunting would likely be less than would the Proposed Action.

All of the RGC facilities in critical and high value winter range would be located within the Manti elk herd unit. Using the same assumptions as for the Proposed Action, the loss of 10 percent of winter range carrying capacity would lead to a reduction in the target Manti elk herd of 1,100 elk, and a reduction in the target buck harvest of 130 bulls (Table 4.7-6).

Black Bear

With Alternative B2, the types of impacts would also be the same as for the Proposed Action, but the area of effect would be reduced (Tables 4.7-7 and 4.7-8). About two-thirds of bear habitat in the Project Area would be located within the critical area where development on BLM lands would be restricted, but there would be an increased density of wells on non-BLM lands within black bear habitat. The area of construction impacts would be decreased about 9 percent to 514 acres, and the area of operational facilities decreased about 7 percent to 308 acres. The area of indirect impacts would be reduced about 17 percent, to 18,544 acres (70 percent of black bear habitat in the Project Area). At full operation (years 10 to 20), 79 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in bear habitat. In addition to existing roads, there would be 41 miles of roads to CBM field facilities within black bear habitat. With 70 percent of its habitat potentially affected, black bear could be eliminated from the Project Area, and would continue to be present only if animals were able to adapt to the increased level of human activity. However, considering the typically dispersed and low density occurrence of black bear, adverse impacts to regional black bear populations would likely be minor and non-significant.

Mountain Lion

Impacts under Alternative B2 would be similar in type but reduced in scale from those described for the Proposed Action. Development would be restricted on federal lands within critical elk and deer winter range, which would provide secure areas for mountain lions and help to maintain them in the Project Area. There would be an increased density of wells and roads outside of these areas. Mountain lion could be displaced from 61 percent (64,100 acres) of habitat, and result in a proportionate decrease in the mountain lion harvest, from 6 to 2.

Pronghorn Antelope

The types of impacts to pronghorn antelope would be similar under Alternative B2 compared to the Proposed Action. The magnitude of direct and indirect impact would be greater because the increased density of wells and facilities, and would be almost identical to Alternative A. Restrictions on development on BLM lands within critical and high value mule deer and elk winter range would have almost no effects in pronghorn antelope habitat.

Moose

The types of impacts and area of direct impact would be about the same with this Alternative as for the Proposed Action; but the area of indirect impact would be reduced about 6 percent (Tables 4.7-11 and 4.7-12). As with Alternative B1, the critical area addressed in this alternative covers about half of the moose winter habitat. Construction of the wellpads,

roads, pipelines and other facilities would involve disturbance or removal of existing vegetation on 348 acres in moose limited value winter range (1.7 percent of this habitat within the Project Area). The project-long total of areas occupied by operational facilities would be 212 acres in moose habitat (1.0 percent of available habitat in the Project Area). At full operation (years 10 to 20), 48 production wells, 1 injection well, 1 evaporation pond, and one compressor station would be located in moose limited value winter habitat. There would also be 29 miles of new or upgraded roads to CBM field facilities. Assuming a displacement distance of 800 meters, the total area of displacement would be 14,073 acres (70 percent of available habitat in the Project Area). With winter road closure, the area of reduced habitat value would be reduced to 11,351 acres (56 percent of habitat available in the Project Area). These changes would be unlikely to have adverse effects on moose populations, because the affected habitat is of limited value.

Raptors

Under Alternative B2, most of the BLM lands in the northwest quarter of the Project Area would again be restricted from development. Since most active raptor nests are in this area, this alternative would have lower conflicts with raptors than the Proposed Action on BLM land. For other lands the full buildout would result in more conflicts than the Proposed Action. Conflicts would be centered around only 8 recently active raptor nests, compared to 13 for the Proposed Action. The types of impacts and applicable environmental protection measures would be the same as for the Proposed Action.

Eight raptor nests active between 1993 and 1995 would be within one-half mile of facilities, including 6 golden eagle nests, 1 buteo nests, and 1 Cooper's hawk nest. Seventeen new wells would be within one-half mile of a recently active raptor nest, including 1 on federal lands, 7 on UDWR land, 6 on state land, and 3 on private land. About 4.5 miles of transportation corridor would be within buffer zones of recently active raptor nests, including about 1 mile on federal land and 2 miles on UDWR land. All eight nests may be affected by facilities on non-federal lands.

4.7.2.5 Alternative C1

This alternative would preclude CBM development on specific portions of the elk and mule deer winter habitat identified as security areas. These areas were developed jointly by UDWR and BLM based on past experience with big game winter distribution patterns, and represent the most valuable winter habitats. Outside of these areas, which occupy 5 percent or less of the total Project Area, development would be the same as with the Proposed Action.

Impacts from this alternative would be similar to those described for the Proposed Action, except for reductions in magnitude and locations of disturbance associated with the security areas. Since most of the Security Areas are directly associated with the major drainages (i.e., Gordon Creek) that serve as primary big game migration routes, protection of these areas would minimize interference with big game movement between seasonal ranges. Another difference between this alternative and the proposed action is that protecting the Security areas from any type of disturbing activity would make these areas suitable for enhancement work designed as

mitigation. Impacts are discussed below for mule deer, elk, black bear, mountain lion, antelope, moose, and raptors. Impacts to sage grouse, white-tailed prairie dog complexes, and songbirds would be the same as those already discussed under the Proposed Action, except for the greater magnitude. In addition, there would be a reduced potential for preventing re-establishment of sage grouse because historic habitat on Telephone Bench would not be developed. The analysis below only describes differences between Alternative C1 and the Proposed Action.

Mule Deer

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Impacts would be decreased because of restrictions on development in the security areas, which includes concentration areas within critical and high value winter range.

Direct impacts on habitat from construction would be decreased by 16 percent (to 1,132 acres) for critical winter habitat and would be decreased by 9 percent (to 1,085 acres) for high value winter habitat (Table 4.7-1). About 709 acres (63 percent) of the construction impacts in critical winter habitat and 630 acres (58 percent) in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (423 acres of critical winter range and 455 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands would represent 0.8 percent of the winter range in the herd unit.

Areas occupied by operational facilities would decrease by 16 percent in critical winter range (to 636 acres), and would decrease by 9 percent in high value winter range (to 649 acres). At full operation (years 10 to 20), 168 production wells, 3 injection wells, 3 evaporation ponds, and one compressor station would be located in critical winter range; and 147 production wells, 1 injection well, 3 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads, there would be about 93 miles of roads servicing gas field facilities in critical winter habitat, and 97 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be 14,505 acres in critical winter habitat (27 percent of that type in the Project Area), and 14,405 acres (28 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 9,116 acres in critical winter range (17 percent of available habitat in the Project Area), and 10,624 acres in high value winter range (21 percent) (Table 4.7-2). This analysis may be conservative (overestimating impacts) because no allowance has been made for the greater value of the security areas as wintering habitat, relative to other winter range. Increases in mortality from vehicle collisions and legal and illegal hunting would be smaller than with the Proposed Action, because of the reduced development.

All of the RGC facilities in critical and high value winter range would be located within the Northeast Manti herd unit. Using the same assumptions as for the Proposed Action, the loss of 16 percent of the winter range carrying capacity would lead to a reduction in the target Northeast Manti deer herd of 2,240 deer, and a reduction in the target buck harvest of 224 bucks (Table 4.7-3). The mule

deer population is currently much lower than the target, and the project therefore may not cause direct mortality of existing deer, but would limit future rebounds in population.

Elk

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Impacts would be decreased because of restrictions on development in security areas, which includes concentration areas within elk critical and high value winter habitat.

Direct impacts on habitat from construction would be decreased by 24 percent (to 618 acres) for critical winter habitat and by 8 percent (tō 1,524 acres) for high value winter habitat (Table 4.7-4). About 237 acres (38 percent) of the construction impacts would be in critical winter range and 1,037 acres (68 percent) in high value winter habitat on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (381 acres of critical winter range and 487 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands represent about 0.9 percent of the winter range in the Project Area.

Areas occupied by operational facilities would decrease by 24 percent in critical winter range (to 362 acres), and by 7 percent in high value winter range (to 882 acres). At full operation, 84 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in critical winter range; and 219 production wells, 3 injection wells, 2 compressor stations and 3 evaporation ponds would be located in high value winter range. In addition to existing paved roads, there would be about 50 miles of roads servicing gas field facilities in critical winter habitat, and 132 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be decreased to 20,856 acres in critical winter habitat (69 percent of that type in the Project Area, and 51,278 acres (76 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 9,369 in critical winter range (31 percent of available habitat in the Project Area), and 38,295 acres in high value winter range (57 percent) (Table 4.7-5). Increases in mortality from vehicle collisions and legal and illegal hunting would likely be less than would the Proposed Action.

All of the RGC facilities in critical and high value winter range would be located within the Manti elk herd unit. Using the same assumptions as for the Proposed Action, the loss of 9 percent of winter range carrying capacity would lead to a reduction in the target Manti elk herd of 990 elk, and a reduction in the target buck harvest of 117 bulls (Table 4.7-6).

Black Bear

With Alternative C1, the types of impacts would also be the same as for the Proposed Action, but the area of effect would be greatly reduced and would be similar to Alternative B1 (Tables 4.7-7 and 4.7-8). About one-quarter of bear habitat in the Project Area would be located within several security areas where development on BLM and UDWR lands would be restricted. The area of construction impacts would be decreased about 24 percent to 428 acres, and the area of operational facilities decreased about 24 percent to 250 acres. The area of indirect impacts would be reduced about 22 percent, to

17,396 acres (65 percent of black bear habitat in the Project Area). At full operation (years 10 to 20), 59 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in bear habitat. In addition to existing roads, there would be 34 miles of roads to CBM field facilities within black bear habitat. With nearly two-thirds of its habitat potentially affected, black bear could be eliminated from the Project Area, and would continue to be present only if animals were able to adapt to the increased level of human activity. However, considering the typically dispersed and low density occurrence of black bear, adverse impacts to black bear populations would likely be minor and non-significant.

Mountain Lion

Impacts under Alternative C1 would be similar in type but reduced in scale from those described for the Proposed Action. Development would be restricted on federal lands within elk and deer security areas. These would also provide secure areas for mountain lions and help to maintain them in the Project Area. Mountain lion could be displaced from about 71 percent (75,300 acres) of habitat, and result in a proportionate decrease in the mountain lion harvest, from 6 to 2.

Pronghorn Antelope

With Alternative C1, the types and magnitude of impacts to pronghorn antelope would be the same as the Proposed Action. None of the areas closed to development is antelope habitat.

Moose

The types of impacts would be the same as for the Proposed Action, but the area of impact would be less, and would be the lowest of any alternative including the Proposed Action, because several of the security areas are located in moose winter habitat. Construction of the wellpads, roads, pipelines and other facilities would involve disturbance or removal of existing vegetation on 259 acres in moose limited value winter range (1.3 percent of this habitat within the Project Area). The project-long total of areas occupied by operational facilities would be 156 acres in moose habitat (0.8 percent of available habitat in the Project Area). At full operation, 32 production wells, 1 injection well, 1 evaporation pond, and one compressor station would be located in moose limited value winter habitat. There would also be 21 miles of new or upgraded roads to CBM field facilities. Assuming a displacement distance of 800 meters, the total area of displacement would be 12,068 acres (59.7 percent of available habitat in the Project Area). With winter road closure, the area of reduced habitat value would be reduced to 9,794 acres (48 percent of habitat available in the Project Area. These changes would be unlikely to have adverse effects on moose populations, because the affected habitat is of limited value.

Raptors

Under Alternative C1, a number of big game security areas would be restricted from development, mainly in the northwest quarter of the Project Area. Several of the active raptor nests are in these areas, and this alternative would have somewhat lower conflicts with raptors than the Proposed Action. Eleven raptor nests would be affected, compared to 13 for the Proposed Action, and the number of wells within buffer zones would be reduced from 24 to 17. The types of impacts and applicable environmental

protection measures would be the same as for the Proposed Action.

Eleven raptor nests active between 1993 and 1995 would be within one-half mile of facilities, including 7 golden eagle nests, 2 buteo nests, 1 Cooper's hawk nest, and 1 historic golden eagle nest used by prairie falcons 1993-1995. Sixteen new wells would be within one-half mile of a recently active raptor nest, including 9 on federal lands, 5 on UDWR land, and 2 on state land. About 7 miles of transportation corridor would be within buffer zones of recently active raptor nests, including about 5 miles on federal land and 1 mile on UDWR land. Seven of the 11 nests would be protected by BLM environmental protection resources, but four of them may be affected by facilities on non-federal lands.

4.7.2.6 Alternative C2

This alternative would preclude CBM development on specific portions of the elk and mule deer winter habitat identified as security areas. Outside of these areas, which occupy 5 percent or less of the total Project Area, development would be similar to Alternative A, with 80 acre well spacing.

Impacts from this alternative would be similar to those described for the Proposed Action, except for reductions in magnitude and locations of disturbance associated with the security areas, and increases associated with the denser well spacing and increased road network. Impacts are discussed below for mule deer, elk, black bear, mountain lion, antelope, moose, and raptors. Impacts to sage grouse, white-tailed prairie dog complexes, and songbirds would be the same as those already discussed under the Proposed Action, except for the greater magnitude. In addition, there would be a reduced potential for preventing re-establishment of sage grouse because historic habitat on Telephone Bench would not be developed. The analysis below only describes differences between Alternative C2 and the Proposed Action.

Mule Deer

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Impacts would be increased because of increased numbers of wells on areas outside the security areas.

Direct impacts on habitat from construction would be increased by 13 percent (to 1,510 acres) for critical winter habitat and by 17 percent (to 1,392 acres) for high value winter habitat (Table 4.7-1). About 955 acres (63 percent) of the construction impacts in critical winter habitat and 845 acres (61 percent in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (555 acres of critical winter range and 547 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands would represent 1.0 percent of the winter range in the herd unit.

Areas occupied by operational facilities would increase by 24 percent in critical winter range (to 936 acres), and would increase by 22 percent in high value winter range (to 871 acres). At full operation (years 10 to 20), 288 production wells, 3 injection wells, 3 evaporation ponds, and one compressor station would be located in critical winter range; and 245 production wells, 1 injection well, 3 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads,

there would be about 119 miles of roads servicing gas field facilities in critical winter habitat, and 118 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be 18,218 acres in critical winter habitat (34 percent of that type in the Project Area), and 17,203 acres (33 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 11,437 acres in critical winter range (21 percent of available habitat in the Project Area), and 12,880 acres in high value winter range (25 percent) (Table 4.7-2). This analysis may be conservative (overestimating impacts) because no allowance has been made for the greater value of the security areas as wintering habitat, relative to other winter range. Increases in mortality from vehicle collisions and legal and illegal hunting would be greater than with the Proposed Action, because of the increased road network.

All of the RGC facilities in critical and high value winter range would be located within the Northeast Manti herd unit. Using the same assumptions as for the Proposed Action, the loss of 20 percent of the winter range carrying capacity would lead to a reduction in the target Northeast Manti deer herd of 2,800 deer, and a reduction in the target buck harvest of 280 bucks (Table 4.7-3). The mule deer population is currently much lower than the target, and the project therefore may not cause direct mortality of existing deer, but would limit future rebounds in population.

__Elk__

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Impacts would be decreased in critical winter habitat because of restrictions on development in security areas, but increased in high value winter habitat because of the greater well density.

Direct impacts on habitat from construction would be decreased by 3 percent (to 787 acres) for critical winter habitat and increased by 21 percent (to 1,890 acres) for high value winter habitat (Table 4.7-4). About 319 acres (41 percent) of the construction impacts in critical winter habitat and 1,374 acres (69 percent) in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (468 acres of critical winter range and 616 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands would represent about 1.1 percent of the winter range in the Project Area.

Areas occupied by operational facilities would increase by 1 percent in critical winter range (to 482 acres), and by 31 percent in high value winter range (to 1,247 acres). At full operation, 140 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in critical winter range; and 366 production wells, 3 injection wells, 2 compressor stations and 3 evaporation ponds would be located in high value winter range. In addition to existing paved roads, there would be about 62 miles of roads servicing gas field facilities in critical winter habitat, and 164 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be decreased to 21,232 acres in critical winter habitat (70 percent of that type in the Project Area), and increased slightly to 53,310

acres (79 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 9,590 acres in critical winter range (32 percent of available habitat in the Project Area), and 39,550 acres in high value winter range (58 percent) (Table 4.7-5). Increases in mortality from vehicle collisions and legal and illegal hunting would likely be less than would the Proposed Action.

All of the RGC facilities in critical and high value winter range would be located within the Manti elk herd unit. Using the same assumptions as for the Proposed Action, the loss of 10 percent of winter range carrying capacity would lead to a reduction in the target Manti elk herd of 1,100 elk, and a reduction in the target buck harvest of 130 bulls (Table 4.7-6).

Black Bear

With Alternative C2, the types of impacts would also be the same as for the Proposed Action, but the area of effect would be reduced, especially for indirect impacts (Tables 4.7-7 and 4.7-8). About one-quarter of bear habitat in the Project Area would be located within several security areas where development on BLM and UDWR lands would be restricted. The area of construction impacts would be decreased about 10 percent to 511 acres, and the area of operational facilities decreased about 6 percent to 310 acres. The area of indirect impacts would be reduced about 21 percent, to 17,646 acres (66 percent of black bear habitat in the Project Area). At full operation (years 10 to 20), 86 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in bear habitat. In addition to existing roads, there would be 40 miles of roads to CBM field facilities within black bear habitat. With two-thirds of its habitat potentially affected, black bear could be eliminated from the Project Area, and would continue to be present only if animals were able to adapt to the increased level of human activity. However, considering the typically dispersed and low density occurrence of black bear, adverse impacts to black bear populations would likely be minor and non-significant.

Mountain Lion

Impacts under Alternative C2 would be similar in type but reduced in scale from those described for the Proposed Action. Development would be restricted on federal lands within elk and deer security areas. These would also provide secure areas for mountain lions and help to maintain them in the Project Area. Mountain lion could be displaced from 74 percent (78,000 acres) of habitat, resulting in a proportionate decrease in the mountain lion harvest, from 6 to 2.

Pronghorn Antelope

With Alternative C2, the types and magnitude of impacts to pronghorn antelope would be the same as Alternative A. Compared to the Proposed Action, the magnitude of impact would be greater because the increased density of wells and area of direct and indirect effect.

Moose

The types of impacts would be the same as for the Proposed Action, but the area of impact would be reduced (Tables 4.7-11 and 4.7-12). The area of construction impacts would be reduced about 15 percent to 303 acres in moose limited value winter range (1.5 percent

of this habitat within the Project Area), and the area of operational facilities reduced to 187 acres in moose habitat (0.9 percent of available habitat in the Project Area). At full operation (years 10 to 20), 46 production wells, 1 injection well, 1 evaporation pond, and one compressor station would be located in moose limited value winter habitat. There would also be 24 miles of new or upgraded roads to CBM field facilities. Assuming a displacement distance of 800 meters, the total area of displacement would be 12,250 acres (61 percent of available habitat in the Project Area). With winter road closure, the area of reduced habitat value would be reduced to 9,880 acres (49 percent of habitat available in the Project Area. These changes would be unlikely to have adverse effects on moose populations, because the affected habitat is of limited value.

Raptors

Under Alternative C2, a number of big game security areas would again be restricted from development, mainly in the northwest quarter of the Project Area. Several of the active raptor nests are in these areas, and this alternative would reduce conflicts with three nests. However, because of the denser development, 2 more wells would be located within raptor buffer zones. The types of impacts and applicable environmental protection measures would be the same as for the Proposed Action.

Thirteen raptor nests active between 1993 and 1995 would be within one-half mile of facilities, including 8 golden eagle nests, 2 buteo nests, 1 Cooper's hawk nest, and 2 historic golden eagle nests recently occupied by prairie falcon. Twenty-six new wells would be within one-half mile of a recently active raptor nest, including 13 on federal lands, 6 on UDWR land, 5 on state land, and 2 on private land. About 12 miles of transportation corridor would be within buffer zones of recently active raptor nests, including about 6 miles on federal land and 1 mile on UDWR land. Seven of the 13 raptor nests would be protected by BLM environmental protection measures, but six raptor nests may be affected by facilities on non-federal land.

4.7.2.7 No Action Alternative

The No Action alternative would preclude CBM development on federal mineral estate lands; however, development on state and private lands would likely occur.

Impacts under this alternative would be similar to those described for the Proposed Action; however, the magnitude of the impacts under the No Action alternative would be much less than the Proposed Action because of the decreased number and density of wells. Impacts are discussed below for mule deer, elk, black bear, antelope, mountain lion, moose, and raptors. Impacts to sage grouse, white-tailed prairie dog complexes, and songbirds would be the same as those already discussed under the Proposed Action, except for the greater magnitude. In addition, there would be a reduced potential for preventing re-establishment of sage grouse because historic habitat on Telephone Bench would not be developed. The analysis below only describes differences between the No Action alternative and the Proposed Action.

Mule Deer

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Impacts would be greatly decreased because there would be little development on

federal lands. However, development on other lands would still result in significant impacts.

Direct impacts on habitat from construction would be decreased by 62 percent (to 512 acres) for critical winter habitat and by 54 percent (to 552 acres) for high value winter habitat (Table 4.7-1). About 110 acres (22 percent) of the construction impacts in critical winter habitat and 121 acres (22 percent) in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (402 acres of critical winter range and 431 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands would represent 0.8 percent of the winter range in the herd unit.

Areas occupied by operational facilities would decrease by 63 percent in critical winter range (to 279 acres), and by 55 percent in high value winter range (to 321 acres). At full operation (years 10 to 20), 65 production wells, 1 injection wells, 1 evaporation ponds, and one compressor station would be located in critical winter range; and 59 production wells, 1 injection well, 3 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads, there would be about 39 miles of roads servicing gas field facilities in critical winter habitat, and 49 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be 6,273 acres in critical winter habitat (12 percent of that type in the Project Area), and 7,630 acres (15 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 4,329 acres in critical winter range (8 percent of available habitat in the Project Area), and 4,418 acres in high value winter range (9 percent) (Table 4.7-2). Increases in mortality from vehicle collisions and legal and illegal hunting would be decreased from the Proposed Action, because of the smaller road network.

All of the RGC facilities in critical and high value winter range would be located within the Northeast Manti herd unit. Using the same assumptions as for the Proposed Action, the loss of 8 percent of the winter range carrying capacity would lead to a reduction in the target Northeast Manti deer herd of 1,120 deer, and a reduction in the target buck harvest of 112 bucks (Table 4.7-3). The mule deer population is currently much lower than the target, and the project therefore may not cause direct mortality of existing deer, but would limit future rebounds in population.

Elk

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Impacts would be greatly decreased because there would be little development on federal lands. However, development on other lands would still result in significant impacts.

Direct impacts on habitat from construction would be decreased by 46 percent (to 433 acres) for critical winter habitat and by 64 percent (to 600 acres) on elk high value winter habitat (Table 4.7-4). About 56 acres (13 percent) of the construction impacts in critical winter habitat and 149 acres (25 percent) in high value habitat would be on BLM land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (377 acres of critical winter range and 451 acres of high

value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands represent about 0.8 percent of the winter range in the Project Area.

Areas occupied by operational facilities would decrease by 48 percent in critical winter range (to 245 acres), and by 64 percent in high value winter range (to 339 acres). At full operation, 56 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in critical winter range; and 66 production wells, 1 injection well, 2 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads, there would be about 34 miles of roads servicing gas field facilities in critical winter habitat, and 50 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be decreased to 16,856 acres in critical winter habitat (55 percent of that type in the Project Area), and to 27,794 acres (41 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 6,492 in critical winter range (21 percent of available habitat in the Project Area), and 21,346 acres in high value winter range (32 percent) (Table 4.7-5). Increases in mortality from vehicle collisions and legal and illegal hunting would likely be less than would the Proposed Action.

All of the RGC facilities in critical and high value winter range would be located within the Manti elk herd unit. Using the same assumptions as for the Proposed Action, the loss of 6 percent of winter range carrying capacity would lead to a reduction in the target Manti elk herd of 660 elk, and a reduction in the target buck harvest of 78 bulls (Table 4.7-6).

Black Bear

Under the No Action alternative, the types of impacts would also be the same as for the Proposed Action, but the area of effect would be reduced, especially for indirect impacts (Tables 4.7-7 and 4.7-8). About one-quarter of black bear habitat is on BLM lands, where there would be little or no development, but activities on the three-quarters of the habitat on other lands would proceed, and result in substantial losses of habitat. The area of construction impacts would be decreased about 28 percent to 406 acres, and the area of operational facilities decreased about 30 percent to 231 acres. The area of indirect impacts would be reduced about 23 percent, to 17,207 acres (65 percent of black bear habitat in the Project Area). At full operation (years 10 to 20), 46 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in bear habitat. In addition to existing roads, there would be 33 miles of roads to CBM field facilities within black bear habitat. With nearly two-thirds of its habitat potentially affected, black bear could be eliminated from the Project Area, and would continue to be present only if animals were able to adapt to the increased level of human activity. However, considering the typically dispersed and low density occurrence of black bear, adverse impacts to black bear populations would likely be minor and non-significant.

Mountain Lion

Impacts under the No Action alternative would be similar in type to the Proposed Action but greatly reduced because there would be little development on federal land.

Mountain lion could be displaced from about 44 percent (46,424 acres) of habitat, resulting in a proportionate decrease in the mountain lion harvest, from 6 to 3.

Pronghorn Antelope

The types of impacts to pronghorn antelope would be similar to the Proposed Action, and the same environmental protection measures would apply. Impacts would be decreased because of the elimination of most development on federal lands.

Direct impacts from construction would be decreased by 41 percent (to 516 acres) within antelope high value yearlong habitat (0.6 percent of habitat available in the Project Area), and by 53 percent to 307 acres of potential antelope habitat (0.5 percent) (Table 4.7-9). Based on a displacement distance of 100 meters, antelope would be displaced from 3,138 acres of high value yearlong habitat during construction (6 percent of that available in the Project Area) (Table 4.7-10). Although antelope do not currently occur west of Highway 10, noise and disturbance would make 1583 acres (5.5 percent) of potential habitat unsuitable for future occupancy.

The area occupied by operational facilities would also decrease, to 294 acres in high value yearlong habitat, and 143 acres in potential yearlong habitat. Displacement effects would continue during operation, although some habituation may occur which would reduce the area of effect. At full operation (years 10 to 20), 79 production wells and 45 miles of new or improved roads would be located in high value winter habitat. The likelihood of future expansion of antelope populations into the potential habitat west of Highway 10 may be reduced; project facilities planned for that area include 23 wells, 2 evaporation ponds, 1 injection wells, 1 compressor station, and 19 miles of new or improved roads, along with 79 existing wells. Although displacement effects are likely to result in decreased use of the Project Area by antelope, they are unlikely to have significant adverse effects on overall antelope populations even at full development, because less than 1 percent of habitat available within the herd unit would be affected, and no critical habitat would be affected. Some increases in hunting and harassment are likely to occur, and may also reduce the number of antelope in the Project Area.

Moose

The types of impacts would be the same as for the Proposed Action, but the area of impact would be reduced (Tables 4.7-11 and 4.7-12). The area of construction impacts in moose habitat would be reduced about 23 percent to 274 acres, and the area of operational facilities would be reduced about 25 percent to 160 acres. At full operation (years 10 to 20), 27 production wells, 1 injection well, 1 evaporation pond, and one compressor station would be located in moose limited value winter habitat. There would also be 33 miles of new or upgraded roads to CBM field facilities. The area of indirect impacts would be reduced to 13,137 acres, about 65 percent of the habitat available in the Project Area. With winter closure, the area of reduced habitat value would be reduced by about 11 percent compared to the Proposed Action, to 10,844 acres, or about 54 percent of the limited value winter habitat in the Project Area. These changes to habitat are unlikely to have adverse effects on moose populations, because the affected habitat is of limited value.

Raptors

Under the No Action alternative, there would be only minor developments on federal lands, and most raptor nests would be more than one-half mile from proposed facilities, resulting in much fewer conflicts than with the Proposed Action. Only four recently active raptor nests would be in conflict with new development, and only seven wells would be affected. The types of impacts and applicable environmental protection measures would be the same as for the Proposed Action.

Four raptor nests active between 1993 and 1995 would be within one-half mile of proposed facilities, including 2 golden eagle nests, 1 buteo nest, and 1 Cooper's hawk nest. Seven new wells would be within one-half mile of a recently active raptor nest, including 1 on federal lands, 5 on UDWR land, and 1 on state land. About 2.5 miles of transportation corridor would be within buffer zones of recently active raptor nests, including about 1 mile on federal land and 1.5 mile on UDWR land. All four of the raptor nests may be affected by activities on non-federal lands.

4.7.3 Impacts Summary

A comparison of the impact of the Proposed Action and the six alternatives is provided in Table 2.7-2. All of the alternatives would involve similar types of impacts, but the magnitude of impact would vary according to the number and distribution of CBM facilities. All of the alternatives would involve significant impacts to big game, and much of the development in big game habitat would be on non-federal lands, and would not be covered by BLM - required environmental protection measures or mitigation.

Impacts would occur from disturbance of habitat during construction, long-term occupancy of habitat by aboveground facilities, increased human presence and activity at all seasons, increased public use of the expanded and improved road network, improved potential for collisions, and improved access for legal and illegal hunting and harassment. Displacement of animals away from human activities would likely have the greatest adverse effects, and would make large areas of habitat unsuitable for wildlife use.

Direct impacts related to construction would occur over a 6 to 10 year period at the beginning of the project. Operational impacts would extend throughout the 30 year project, but would be highest in the middle years after all wells and roads have been constructed, and before any have been abandoned and reclaimed. For most species, indirect (displacement) impacts would be greatest during this period. Wells would be abandoned and reclaimed at the end of their estimated 20 year life span, and would decrease in number through the last 10 years of the project. At the end of the project, approximately 30 years after startup, all wells would be reclaimed, but some roads may remain open. Wildlife displaced from the area during operation may reoccupy the Project Area as the project facilities are closed.

Quantitative impacts are evaluated and compared for direct disturbance of habitat, and for indirect (displacement) effects, for mule deer, elk, black bear, pronghorn antelope, moose, and raptors. For mule deer, elk, and pronghorn antelope, several different types of habitat are evaluated, representing different types of seasonal use and importance. The 7 alternatives would generally affect between 1 and 4 percent of the specific seasonal habitats available in the Project Area. Elk and deer winter habitats

overlap in the Project Area. A summary of impacts to combined elk and deer critical and high priority habitat is provided in Table 4.7-13. Direct impacts to elk and deer habitat on federal lands would be compensated by habitat enhancement projects.

Displacement effects would impact much larger areas than direct effects. Displacement effects would be reduced by using gate closures where possible to minimize motorized vehicle access to winter habitat during the critical season. The 7 alternatives would have the following indirect effects, in terms of acre reductions of habitat value, and percent of the habitat available in the Project Area:

- 4,300 to 13,000 acres of deer critical winter habitat (8 to 24 percent)
- 4,400 to 13,400 acres of deer high value winter habitat (8 to 26 percent)
- 5,500 to 10,800 acres of elk critical winter habitat (21 to 36 percent)
- 21,300 to 38,502 acres of elk high value winter habitat (32 to 57 percent)
- 17,200 to 22,400 acres of black bear high value yearlong habitat (65 to 85 percent)
- 46,000 to 84,400 acres of mountain lion habitat (44 to 80 percent)
- 3,400 to 8,300 acres of antelope high value yearlong habitat (6 to 17 percent)

Funds provided under the BLM's Wildlife Habitat Mitigation Program would reduce the magnitude of indirect impacts to area deer and elk, but would not eliminate them.

Reductions in elk and deer winter range would be likely to lead to reduced regional populations. Mule deer winter range in the Project Area makes up most of the winter range available in the Northeast Manti deer herd unit, and elk habitat in the Project Area provides about 30 percent of the winter range for the Manti elk herd. The various alternatives would displace wildlife from about 8 to 23 percent of winter habitat for the North Manti deer unit, and 6 to 11 percent of winter habitat for the Manti elk herd, resulting in corresponding population reductions (or limits on future growth), and reductions in harvest. Loss of black bear, antelope, and moose habitat would be unlikely to have adverse effects on regional populations or harvest, although local use would be reduced.

Between 4 and 14 recently active raptor nests would be located within one-half mile of CBM facilities. Adverse indirect effects would be limited by several environmental protection measures.

In general, Alternative B1 and the No Action alternative would have the lowest impacts, and Alternative A the highest impacts, followed by Alternative C2. The critical areas avoidance alternatives (B1 and B2) and security areas protection alternatives (C1 and C2) would provide protection for much of the most critically valued habitats for big game, black bear, mountain lion, and sage grouse; protects the primary migration corridor for the Gordon Creek winter range, and provide the opportunity for wildlife habitat enhancement projects within the Project Area.

4.7.4 Mitigation

The environmental protection measures described in Section 2.2.5 would provide some protection for wildlife resources. However, additional mitigation measures are

recommended to reduce impacts or to compensate for impacts.

Direct and indirect impacts to wildlife critical and high value winter habitat should be mitigated consistent with the BLM's Wildlife Habitat Mitigation Plan (Appendix 4C). Impacts should be mitigated, to the extent possible, within the same herd unit, in order to benefit the impacted population. Impacts should be mitigated within the Project Area if possible, but may be mitigated off-site or outside of the herd unit. Existing requirements for 1:1 enhancement of adjoining habitat for surface disturbing activities on critical winter range (BLM 38) should be extended to include impacts to high value winter habitat. These should include physical habitat enhancement projects such as vegetation treatments to increase the quality and quantity of forage. Displacement impacts to critical and high value winter habitats should be mitigated through changes in surface management, to eliminate resource conflicts (such as eliminating competition with wildlife resources on critical winter range).

In order to ensure that environmental protection measures for raptors are effective, annual or biennial monitoring of raptor nesting activity should be conducted near proposed wells.

With permission of landowners, RGC should install design features (speed bumps or dips) to limit excessive rates of speed in sensitive wildlife habitat, to reduce the potential for vehicle collisions with wildlife.

Wells and facilities should be placed behind visual screens, such as topography and dense pinyon forest. Placement of wells, roads and facilities along forest/sage-grassland edge should be avoided.

RGC's information and education program should include local, state and federal wildlife laws and regulations, general natural history and wildlife species of the area, potential impacts to wildlife, and measures to avoid or mitigate impacts to wildlife. Workers should be instructed to report raptor nests, sage grouse observations, wildlife moralities, and other noteworthy observations to the BLM and UDWR.

4.7.5 Unavoidable Adverse Impacts

Unavoidable adverse impacts to wildlife and fisheries would be direct loss of some habitat; displacement of mule deer and elk from winter range; and increase in potential for vehicle related wildlife moralities and injuries. Adequate sized and suitable areas for mitigation of direct and indirect impacts may not be available within the Project Area or herd units, and wildlife winter habitat carrying capacity and deer and elk populations may be reduced for the life of the project. Implementation of mitigation as described in Sections 2.2.5 and 4.7.3 would reduce, but not eliminate, impacts. In addition, a lag time of vegetation establishment would likely occur between the initiation of reclamation and habitat enhancement and the establishment of big game habitat of equal quality to habitat lost. This could result in the short-term reduction in carrying capacity of big-game for the first one to five years, depending on the relative scheduling of habitat enhancement and the construction of wells and roads.

4.8 SPECIAL STATUS SPECIES

4.8.1 Introduction

Thirteen species of federally listed threatened or endangered plant or animal species, and 17 other sensitive species have been identified as

potentially occurring within Carbon and Emery counties. These include 9 species of plants, 7 species of terrestrial wildlife, 8 species of bats, and 6 species of fish.

As described in Section 3.8, this EIS will serve as a Biological Assessment as part of BLM's compliance with Section 7 of the Endangered Species Act. The description of the Proposed Action is provided in Chapter 2, description of the affected environment for listed threatened and endangered species is provided in Section 3.8.3, and analysis of project effects is provided in this section. Project effects to be addressed include direct, indirect, beneficial and cumulative impacts, and those caused by interrelated and interdependent actions. Cumulative effects under ESA regulations refers to state and private actions that are reasonably certain to occur within the Project Area in the foreseeable future. In this context, impacts from project development on state and private lands outside of federal mineral ownership would be considered as cumulative effects for the Biological Assessment, since BLM has no authority to permit or deny them. These types of impacts are discussed below under direct and indirect impacts, rather than in Chapter 5. This section also includes a summary of conclusions regarding whether the BLM's action (approval of the project on federal land) may affect a listed species. A summary of the conclusions for listed species is provided in Table 4.8-1. Copies of correspondence are included in Appendix 3C.

The other 17 species evaluated in this section are not protected under the federal ESA, but are considered sensitive by BLM and state agencies.

Federally endangered threatened and endangered species are protected under the ESA, and compliance with the ESA would be required under federal law and under standard lease terms, for all project components. Sensitive species are protected on federal lands under BLM policies and guidelines. Environmental protection measures listed in Section 2.2.5 that may minimize impacts to endangered, threatened and sensitive species include RGC 12 (speed limits), RGC 14 (seasonal avoidance of raptor nests), BLM 1(site selection), BLM 4 to 5 (avoidance of streams and springs), BLM 8 to 23 (erosion control and reclamation), BLM 31 to 35 (water-related measures), BLM 36 (avoidance of wetland and riparian areas), and BLM 40 (raptor nest buffer zones).

4.8.2 Direct and Indirect Impacts

4.8.2.1 Proposed Action

Federal Endangered and Threatened Species

Bald Eagle. Potential impacts to bald eagles include increased mortality and disturbance to winter roosts.

Bald eagles that pass through the Project Area or roost within the Project Area during winter may be attracted to road killed wildlife, and would therefore be more vulnerable to injury or death from increased vehicle traffic as a result of CBM construction and operation. The death of a single bald eagle would constitute a significant impact. However, speeds on collector, local, and resource roads would be maintained below 25 mph and would therefore be unlikely to increase eagle mortality.

Four bald eagle roost sites were identified during surveys conducted in the winter of 1994-1995. At least one roost which meets the criteria for critical winter habitat occurs in the Project Area, along with several smaller roost sites. Direct removal or disturbance to roosts

would cause the abandonment of the roost and may be subject to prosecution under the "takings" provision of the ESA. However, no existing bald eagle winter roost would be removed by any alternative.

Any activity within 0.25 miles (400 meters) of critical bald eagle roosts during the winter (October 15 to March 15) could potentially cause the abandonment of the roost (Martell 1992), and may also be considered a "takings" under the ESA. Indirect impacts to roost sites were evaluated by placing a 400-meter (1/4 mile) buffer around the four identified roost sites and assessing the magnitude of encroachment by CBM wells, roads and facilities within these buffers (Table 4.8-2):

- Two roost sites on Gordon Creek potentially support bald eagles for a period of more than two weeks. These two sites are within 800 meters (0.5 mile) of each other and eagles probably alternate between the two. These two sites combined probably support more than 15 bald eagles depending on the severity of the winter and the prey available, and appear to be critical winter habitat. The closest project facilities would be further than the 400-meter buffer, but within 800 meters.

- Another primary roost site on Miller Creek is on private land, and does not appear to meet the criteria for critical winter habitat. However, the closest wells and facilities would be more than 800 meters from this roost.

- The fourth roost, consisting of a single cottonwood tree near Bull Point, was only observed to contain two bald eagles on a single occasion and appears to be a minor roost site. The Proposed Action would have facilities within 400-meters of this site.

Both direct and indirect impacts to bald eagles and to critical winter roost sites would be unlikely to occur under the Proposed Action. Minor impacts may occur through displacement from a minor roost site.

Peregrine Falcon. Peregrine falcon may be adversely affected by the Price Coalbed Methane Project. Potential impacts include disturbance or harassment of nesting birds, leading to nest failure or abandonment, and reduction of prey base.

The peregrine falcon nest discovered in 1996 is located on a cliff at the edge of the Project Area, and overlooks the Project Area. USFWS and UDWR guidelines for protection of raptor nests (USFWS 1984; Zoblan 1996; Bates 1996a) provide for a one-mile buffer zone around active nests during the breeding season (February 15 to July 15). Construction activity would not be allowed during this period, but could occur during other parts of the year., and operational activities would not be restricted within this buffer zone. With this mitigation, significant disturbance to nesting peregrines would be unlikely. Only a few project facilities would be affected by this requirement: four proposed wells and about 2 miles of access road are located within 1 mile of the 1996 nest site. The closest wells are slightly more than one-half mile away, and about one-quarter mile of proposed road is within one-half mile. One of the proposed wells and some of the access road are located on Utah state land, and the remainder are on BLM land. The numbers and locations of facilities within 1 mile may vary in the future if the peregrine pair use a different nesting site.

Environmental protection measures that would additionally reduce the potential for impacts to nesting peregrines include RGC 10 (prohibition of carrying firearms by employees and contractors), RGC 11 (training on wildlife protection measures), BLM 40 (no surface occupancy within one-half mile of nests active within a three year period), and BLM 41 (spring raptor surveys of areas proposed for construction).

Prey populations (mainly medium and small sized birds) may be slightly reduced by removal of vegetation. Within one mile of the nest, the amount of vegetation occupied by operational facilities would be about 15 acres, or about 1 percent of this area. About 80 percent of the proposed project facilities would be built within a 10-mile radius of the nest (the radius of the average hunting area), and would result in removal of about 1 to 2 percent of the vegetation during operation. Additional short-term vegetation loss would occur during construction.

Peregrine falcon populations in central and southern Utah are healthy and expanding. The 110 nesting pairs now present exceeds the recovery goals for this population (Bates 1996a).

Black-footed Ferret. Partial winter surveys and complete summer surveys of all known prairie dog towns within the Price River CBM Project Area and areas of influence, found no evidence of black-footed ferrets. Surveys were conducted according to USFWS survey protocol by trained biologists. Based on the results of these surveys, development of the Price River CBM Project would not likely impact the black-footed ferret.

Colorado River Fish. The closest documented occurrence of threatened and endangered Colorado River fish (Colorado River squawfish, humpback chub, bonytail chub and razorback sucker) is in the Price River, 50 miles from the Project Area, near the confluence of the Green River, and they would not be directly affected by the Proposed Action.

Consumptive water use associated with the project is shown in Table 2.2-4. Consumptive use of water from the Colorado River Basin would total 492 ac-ft over the life the project, or about 49 ac-ft per year. This amount of consumptive use is below the 100 ac-ft annual use threshold for compensation, established by USFWS, and is unlikely to result in adverse impacts. Indirect impacts such as degradation of water quality within Colorado River fish habitat are also unlikely. Although disturbance to saline soils could increase erosion and runoff of dissolved salts into surface water, impacts are likely to be minor and local, and unlikely to affect habitat 50 miles or more downstream from the Project Area. Wells and other facilities would be located to minimize ground surface disturbance within 330 feet of perennial streams. In addition, erosion control and revegetation measures would be implemented which would help minimize runoff.

Endangered or Threatened Plants. The six listed plant species in Emery County (Barneby reed mustard, Jones cycladenia, Last Chance townsendia, Maguire daisy, San Rafael cactus, and Wright fishhook cactus) are highly unlikely to occur in the Project Area, and the project will have no impacts on them.

<u>Sensitive Species</u>

Northern Goshawk. No impacts to northern goshawks are anticipated due to lack of suitable habitat for this species. No northern goshawks or potential breeding habitat were identified during surveys of the Price River

CBM Project Area. An occasional goshawk may pass through the area during migration or forage in the higher elevations, but would be unlikely to nest within the Project Area.

Ferruginous Hawk. Ferruginous hawk are known to nest within the Project Area, and one active nest was found during a detailed raptor nest survey for this project (Parrish 1995). This nest is located several miles from the nearest planned project facility and outside the project boundary, and would not be affected. There are other recent and historic ferruginous hawk nest locations near project facilities. Ferruginous hawks are very sensitive to human disturbance and would likely abandon a nest if disturbed. On federal lands, adverse effects would be unlikely with the application of environmental protection measure BLM 40. RGC 14 would similarly protect nesting ferruginous hawks during construction but would not protect nests from disturbance during operation and maintenance. These activities on private or state land could cause nest abandonment and mortality to young if ferruginous hawks occupied a nest near project facilities.

Western Burrowing Owl. Approximately 7,094 acres of prairie dog towns occur within the Project Area (MDG 1995b) that could provide breeding habitat for the burrowing owl. Any disturbance to prairie dog towns that affect openness, vegetation height, prairie dog densities, and burrow availability have the potential to adversely impact burrowing owl populations. Of these four components, short vegetation height and burrow availability are the most critical for maintaining owl populations (Marks and Ball 1983, Thomsen 1971, Martin 1973, Zarn 1974). Burrowing owls apparently acclimate to human presence and can be found in disturbed open areas such as road cuts and airports (Finch 1992). Owls also tend to select their burrows in areas with other burrows close to roads (Plumpton 1992) and vehicle traffic has little impact on productivity of burrowing owls (Plumpton and Lutz 1993), although there is a potential for collisions with vehicles. There may also be increased mortality from shooting.

The primary direct effect of the project would be destruction of nesting burrows during the nesting season (April to August) (Haug et al. 1993). Because of the extent of prairie dog towns within the Project Area it would not be possible to minimize possible impacts to burrowing owls by avoiding placement of well, roads and other facilities in prairie dog towns.

If construction is planned during the egg-laying to fledging period (April to August), a site-specific search of the planned disturbance area should be conducted to determine the presence or absence of active nest burrows. If present, construction on or immediately adjacent to nesting burrows should be avoided or delayed until the end of nesting. RGC employees and contractors should report all observations of active burrowing owl nests to the BLM. On federal lands, adverse impacts would be unlikely with use of this mitigation.

Loggerhead Shrike. Construction may result in destruction of active shrike nests or disturbance sufficient to cause abandonment of the nests, which would be considered a significant impact. Additional hunting perches would be created by overhead powerlines and structures on well pad sites.

If construction is planned during the breeding season (April to mid-July) in potential shrike habitat, a site-specific search of the planned disturbance area should be conducted to determine the presence or absence of active nests. If present, construction on or

immediately adjacent to nests should be avoided or delayed until the end of nesting. RGC employees and contractors should report all observations of active nests to the BLM. On federal lands, adverse impacts would be unlikely with use of this mitigation.

Spotted Bat. No spotted bats have been documented within the Project Area, but the Project Area includes potentially suitable habitat and they are likely to occur (Toone 1993, 1995). The most critical factor in spotted bat habitat is the presence of cracks and crevices of the right size in limestone or the preferred sandstone formations (Poche 1981). Because few, if any, sandstone cliff formations would be disturbed by the Proposed Action, adverse impacts to spotted bats are unlikely. Additionally, spotted bats are apparently tolerant to human presence as major roosting areas have been documented near heavy human disturbance (Fenton et al. 1987, Navo 1990).

Other Bats. Seven other sensitive (former category 2) bat species may occur in the Project Area. The project is unlikely to affect foraging bats or food supply, or typical roosts in caves, mines, and crevices in cliffs. Bats roosting in trees could be disturbed during construction, and bats attempting to use compressor station vent stacks may be killed or injured. These impacts would be unlikely to affect overall populations of these species in the Project Area and region.

Colorado River Fish. Impacts to sensitive Colorado River fish would be the same as those previously described for threatened and endangered Colorado River fish. No direct or indirect adverse impacts to roundtail chub or flannelmouth sucker are likely to occur, from reduction of water quantity or quality.

Creutzfeldt Catseye (Cryptantha). There will be no direct impacts to the two known occurrences near Price, and the nearest project facility would be located almost a mile away. Both of these known locations are on private land. This species could potentially occur at currently undiscovered locations on Mancos shale badlands at elevations of 5,600 to 6,800 feet throughout the Project Area. If present in construction areas, construction of project facilities could destroy individual plants and may jeopardize local populations. Impacts would be significant if they threatened the viability of the local population, and/or induced an upgrade in status. Impacts would be minimized or avoided through pre-construction surveys followed by avoidance or mitigation of impacts.

Canyon Sweetvetch. This species could potentially occur at currently unknown locations in mesic and shaded areas along perennial and intermittent streams and washes in the Project Area. Existing stipulations and mitigations would protect most potential habitat on federal lands. This includes the existing BLM stipulation that prohibits occupancy or surface disturbance within 330 feet of the centerline or within the 100-year recurrence interval floodplain (whichever is greater) of perennial streams. Impacts would be further minimized or avoided through pre-construction surveys followed by avoidance or mitigation of impacts.

Graham Beardtongue. This species is highly unlikely to occur in the Project Area, and the project would have no impacts on it.

4.8.2.2 <u>Alternative A</u>

Alternative A would increase the density and number of wells to 1,105, and increase the number of roads, pipelines, electrical lines and

ancillary facilities (Section 2.3). The land area disturbed would be about 40 percent greater than the Proposed Action.

Impacts to listed threatened and endangered species would be the same as for the Proposed Action. Bald eagles occur in the Project Area, but are not likely to be adversely affected. No wells would be located closer than 400 meters from primary winter roosts. Peregrine falcon may be adversely affected by construction and operation of facilities near the nest. Five wells and about 2.25 miles of access roads would be within 1 mile of the 1996 nest site. The same stipulations and mitigations would apply as in the Proposed Action. Four Colorado River fish species occur 50 or more miles downstream, and would be unlikely to be adversely affected. Average annual consumption of water from the Colorado River drainage would be 85 acre-feet/year, the highest use for any of the alternatives. Black-footed ferret and six listed plant species are not known or expected to occur in the Project Area, and would not be affected.

Impacts to sensitive species from this alternative would be similar to those described for the Proposed Action. There would be more surface disturbance and human activity potentially conflicting with burrowing owl, loggerhead shrike, ferruginous hawk nests, and sensitive plant habitat. On federal lands mitigations for this alternative would be the same as for the Proposed Action and the resulting impacts after application of mitigations and stipulations would be similar. BLM mitigations would not apply on non-federal lands, and the project may adversely impact these species if they are present near project facilities. About 48 percent more SITLA and private land would be disturbed by Alternative A compared to the Proposed Action. Impacts to all other species would be the same as for the Proposed Action.

4.8.2.3 Alternative B1

Alternative B1 would preclude CBM well development on the federal mineral estate within the combined deer and elk critical winter range under the 160-acre well spacing scenario (Section 2.4.1). The area of surface disturbance would be about 75 percent of the Proposed Action. Effects on listed threatened and endangered species would be the same as for the Proposed Action, except that there would be only 3 wells within 1 mile of the 1996 peregrine falcon nest site.

Impacts on sensitive species from this alternative would be similar to those described for the Proposed Action. There would be less surface disturbance and human activity potentially conflicting with burrowing owl, loggerhead shrike, ferruginous hawk nests, and sensitive plant habitat. Impacts to all other species would be the same as for the Proposed Action. Mitigations for this alternative would be the same as for the Proposed Action and the resulting impacts after application of mitigations and stipulations would be similar.

4.8.2.4 Alternative B2

Alternative B2 would preclude CBM well development on the federal mineral estate within the combined deer and elk critical winter range under the 80-acre well spacing scenario (Section 2.4.2). The area of surface disturbance would be about 10 percent larger than for the Proposed Action. Effects on listed threatened and endangered species would be the same as for the Proposed Action except that there would be only 3 wells within 1 mile of the 1996 peregrine nest site.

Impacts to sensitive species from this alternative would be similar to those described for the Proposed Action. There would be more

surface disturbance potentially conflicting with burrowing owl, loggerhead shrike, ferruginous hawk nests, and sensitive plant habitat. Impacts to all other species would be the same as for the Proposed Action. Mitigations for this alternative would be the same as for the Proposed Action and the resulting impacts after application of mitigations and stipulations would be similar.

4.8.2.5 Alternative C1

This alternative would restrict development within concentration (security) areas for mule deer and elk on BLM and UDWR lands. The area of surface disturbance would be about 8 percent less than the Proposed Action. Effects on listed threatened and endangered species would be the same as for the Proposed Action.

Impacts to sensitive species would be similar to the Proposed Action. There would be slightly less disturbance potentially conflicting with burrowing owl, loggerhead shrike, ferruginous hawk nests, and sensitive plant habitat. Impacts to all other species would be the same as for the Proposed Action. Mitigations and residual impacts after mitigation would also be the same.

4.8.2.6 Alternative C2

This alternative would restrict development within concentration (security) areas for mule deer and elk on BLM and UDWR lands, combined with an increase in well density to 80-acre spacing. The area of surface disturbance would be about 38 percent more than the Proposed Action.

Effects on listed threatened and endangered species would be the same as for the Proposed Action except that there would be 5 wells within 1 mile of the 1996 peregrine falcon nest site.

Impacts to sensitive species would be similar to the Proposed Action. There would be more surface disturbance potentially conflicting with burrowing owl, loggerhead shrike, ferruginous hawk nests, and sensitive plant habitat. Impacts to all other species would be the same as for the Proposed Action. Mitigations and residual impacts after mitigation would also be the same.

4.8.2.7 No Action Alternative

The No Action alternative would preclude CBM development on federal mineral estate lands; however, development on state and private lands would likely occur. The area of surface disturbance would be less than half as much as the Proposed Action. Impacts to listed threatened and endangered species would be the same as for the Proposed Action except that there would be only 1 well and about 1 mile of road within 1 mile of the 1996 peregrine falcon nest site.

Impacts from this alternative would be similar to those described for the Proposed Action. There would be less surface disturbance potentially conflicting with burrowing owl, loggerhead shrike, ferruginous hawk nests, and sensitive plant habitat. Impacts to all other species would be the same as for the Proposed Action. Mitigations for this alternative would be the same as for the Proposed Action and the resulting impacts after application of mitigations and stipulations would be similar.

4.8.3 Impacts Summary

A comparison of the impacts of the Proposed Action and the six alternatives is provided in Table 2.7-2. All of the alternatives may adversely affect peregrine falcons. In addition, all alternatives could destroy or disturb burrowing owl, loggerhead shrike, and ferruginous hawk nests and have the potential

to damage undocumented occurrences of sensitive plant species. On federal lands impacts to these species would be minor and non-significant, assuming the application of committed and proposed mitigation measures. BLM mitigation would not apply on state or private lands, and impacts may occur under all alternatives (including No Action) if nests or plants are located at facility locations. Impacts to other threatened, endangered or sensitive species would be minor, or none.

4.8.4 Mitigation

The mitigations included in the Proposed Action and environmental protection measures would provide protection for endangered, threatened and sensitive species. In addition, the following mitigations should be required to reduce or avoid impacts:

- No construction should occur within 1 mile of an active peregrine falcon nesting during the nesting season (February 15 to July 15).

  According to Bald Eagle Winter Management Guidelines (Martell 1992) the location of critical roosts should be kept confidential and buffer zone restrictions should be strictly enforced. Buffer zones of at least 1/4 mile (402 meters) should be established around the edges of all critical roosts. No human activity should be allowed in these zones from October 15 to March 15. From March 16 to October 15 human activity may be allowed if it does not damage or destroy trees in the roost.

- If construction is planned during the breeding season in potential shrike or burrowing owl habitat, a site-specific search of the planned disturbance area should be conducted to determine the presence or absence of active nests. If present, construction on or immediately adjacent to nests should be avoided or delayed until the end of nesting. RGC employees and contractors should report all observations of active burrowing owl nests to the BLM. Adverse impacts would be unlikely with use of this mitigation.

- Prior to construction, botanical clearance surveys should be conducted in an appropriate season in all areas of potential habitat for Creutzfeldt catseye and canyon sweetvetch that would be directly affected. If previously undocumented occurrences are found, their occurrence should be reported and direct impacts avoided by minor realignment of facilities. If avoidance is not possible, appropriate mitigation should be developed in consultation with the BLM and other agencies.

- RGC should use screening on vent pipes at compressor stations to prevent bats from roosting in them.

4.8.5 Unavoidable Adverse Impacts

Unavoidable adverse impacts to threatened, endangered and sensitive species would be a loss of some foraging and nesting habitat (peregrine falcon, bald eagle, burrowing owl); and some increase in potential for vehicle related wildlife moralities and injuries. There would be no unavoidable adverse impacts to sensitive plant species.

4.9 CULTURAL RESOURCES

4.9.1 Introduction

Cultural resources are highly sensitive to ground disturbance. Direct impacts to prehistoric and historic archaeological sites would occur from ground-disturbing activities associated with construction of CBM wells, compressor stations, other facilities, access roads, pipelines, and electrical lines. Most archaeological sites in the Project Area are shallow, and cultural deposits would be damaged or destroyed by vegetation clearing and blading or excavation of soils. Standing historic structures, because they are readily identifiable, are less likely to be subject to these types of impacts. The 12 historic buildings in Price and Spring Glen that are listed on the NRHP would not be directly impacted.

Cultural resources may also be subject to indirect impacts such as increased vandalism, artifact collection from the surface of sites, and illegal excavation of archaeological sites as a result of opening previously inaccessible areas to construction crew members and to the general public. Such indirect impacts pose a threat to cultural resources because those activities destroy the potential for recovery of significant scientific information regarding the past. Indirect impacts can also destroy the character of the site, making it worthless for future public enjoyment or education.

The Advisory Council on Historic Preservation (ACHP) has set procedures (36 CFR 800) to be followed to determine the effect a project may have on significant cultural resources and how to mitigate that effect if it is determined to be adverse. The BLM, SHPO, ACHP, and RGC are pursuing execution of a Programmatic Agreement (PA) for cultural resources that stipulates how significant cultural resources are to be treated, including site avoidance or protection measures and mitigation of adverse effects. The PA will serve as the official compliance document and will be completed prior to issuance of a ROD for the overall project.

When no sites or properties eligible to or listed on the NRHP are located in the APE, the Proposed Action can be determined to have "No Historic Properties," and the action can be allowed to proceed with no further archaeological work. If any site(s) currently on or eligible for nomination to the NRHP is present in the APE, steps must be taken to avoid adverse impacts to the cultural property. An action is considered to have an adverse effect when it may diminish the integrity of the significant property's location, design, setting, materials, workmanship, feeling or association. Adverse effects include but are not limited to:

1. Physical destruction, damage, or alteration of all or part of the property

2. Isolation of the property from or alteration of the character of the property's setting, when the character contributes to the property's eligibility to the National Register

3. Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting

4. Neglect of a property resulting in its deterioration and destruction

5. Transfer, lease, or sale of the property

For most archaeological sites, the first effect is of the greatest concern. Effects 2 through 4 are more likely to adversely affect historic

structural sites or rural historic landscapes. All five effects, however, would probably be considered adverse impacts to traditional cultural properties significant to Native Americans.

Effects of an undertaking that would otherwise be found to be adverse may be considered as being not adverse when the historic property is of value for its potential contribution to archaeological, historical, or architectural research (i.e., criterion 36 CFR 60.4 [d] only), and when its significant values can be substantially preserved through research or archaeological data recovery efforts conducted in accordance with applicable professional standards and guidelines. The Environmental Protection Measures (EPM) identified in Section 2.2.5 implement measures to: identify, evaluate, and treat historic properties (BLM42); consult with Native American groups regarding traditional cultural properties (BLM43); evaluate and treat historic properties encountered during construction or operation (BLM44); and deal with human remains encountered on federal lands (BLM44). The UDWR and SITLA Lands both also require cultural/historic surveys of areas affected by land-disturbing operations. Environmental protection measure RGC 18 further specifies that RGC would educate its work crews to not collect, excavate, or otherwise disturb cultural resource materials found within or near the Project Area. These measures would protect significant cultural resources in the Project Area from many adverse impacts resulting from the Proposed Action or any of the alternatives.

Direct disturbance or destruction of significant cultural resource sites would take place within any areas subject to direct disturbance from development. Direct impacts would occur during the construction and drilling phase of the project. Additional direct impacts to cultural resources are not anticipated during the production phase or during the final reclamation and abandonment phase, providing that ground disturbance associated with those actions is restricted to the APE, as defined below. The acreage calculations for direct impacts under the Proposed Action and each alternative (Table 4.9-1) include the proposed short-term disturbance areas for transportation corridors plus the proposed disturbance areas for compressor stations, evaporation ponds, injection wells, and proposed wells. Existing facilities are not included in the totals. Significant cultural resources are expected in the high and medium sensitivity zones. Because the cultural resource inventory would not be conducted until after the EIS is complete, the numbers and types of significant sites within the Proposed Action and each alternative are presently unknown. Acres of direct disturbance have been used to quantify the potential direct impacts to cultural resources.

The APE is larger than the direct impact area and judged to be the area within which indirect loss of important cultural materials due to private collection or vandalism may occur, or where there may be direct or indirect disturbance or destruction of important Native American religious or culturally significant sites. The APE for cultural resources is of variable size, depending upon the projected levels of sensitivity for cultural resources identified in Section 3.9.2 (Table 4.9-2). In low sensitivity areas, the APE is defined as the direct impact areas only and a 100-foot-wide corridor centered along transportation routes. In medium sensitivity areas, the APE is defined as the actual disturbance area plus an additional 75 feet along each side or a

minimum of 10 acres surrounding wells and other CBM facilities, whichever is larger, and a 150-foot-wide corridor centered on all transportation routes. In high sensitivity areas, the APE is defined as the actual disturbance area plus an additional 150 feet along each side or a minimum of 10 acres surrounding well locations and other CBM facilities, whichever is larger, and a 300-foot-wide corridor centered on all transportation routes. The total APE acreage figures within each sensitivity zone (Table 4.9-3) have been used to quantify the potential secondary disturbance to cultural resources.

4.9.2 Direct and Indirect Impacts

4.9.2.1 Proposed Action

The Proposed Action would result in ground disturbance and potential direct impacts to significant cultural resources throughout the Project Area. Acres disturbed during construction amount to 1,613 acres of the high sensitivity zone (1.9 percent of the total), 1,985 acres of the medium sensitivity zone (2.4 percent of the total), and 496 acres of the low sensitivity zone (2.5 percent of the total) (Table 4.9-1). The APE for the Proposed Action, where indirect impacts resulting from increased access to cultural resources may result, includes 7,487 acres of high sensitivity(8.7 percent of the total), 6,168 acres of medium sensitivity (7.5 percent of the total), and 603 acres of low sensitivity (3.1 percent of the total) (Table 4.9-3). Significant cultural resources are not expected to be present in the low sensitivity zone. Cultural resource inventories of 14,259 acres would be required for the Proposed Action.

4.9.2.2 Alternative A

Alternative A would result in more ground disturbance and potential direct impacts to significant cultural resources than the Proposed Action. Impacts would occur throughout the Project Area. Acres disturbed during construction of Alternative A (Table 4.9-1) amount to 2,109 acres of the high sensitivity zone (2.4 percent of the total), 2,754 acres of the medium sensitivity zone (3.3 percent of the total), and 897 acres of the low sensitivity zone (4.6 percent of the total). Significant cultural resources are not expected to be present in the low sensitivity zone. The APE for Alternative A (Table 4.9-3) includes 10,327 acres of high sensitivity (11.9 percent of the total), 9,571 acres of medium sensitivity (11.7 percent of the total), and 1,106 acres of low sensitivity (5.6 percent of the total). Cultural resource inventories of 21,004 acres would be required for Alternative A.

4.9.2.3 Alternative B1

Alternative B1 would result in less ground disturbance and potential direct impacts to significant cultural resources than the Proposed Action. Impacts would be restricted to a smaller geographic area. Acres disturbed during construction of Alternative B1 (Table 4.9-1) amount to 1,216 acres of the high sensitivity zone (1.4 percent of the total), 1,439 acres of the medium sensitivity zone (1.8 percent of the total), and 496 acres of the low sensitivity zone (2.5 percent of the total). Significant cultural resources are not expected to be present in the low sensitivity zone. The APE for Alternative B1 (Table 4.9-3) includes 5,263 acres of high sensitivity (6.1 percent of the total), 4,321 acres of medium sensitivity (5.3 percent of the total), and 603 acres of low sensitivity (3.1 percent of the total). Cultural resource inventories of 10,187 acres would be required for Alternative B1.

4.9.2.4 Alternative B2

Alternative B2 would result in ground disturbance and potential direct impacts to significant cultural resources within a smaller geographic area than the Proposed Action. Acres disturbed during construction (Table 4.9-1) amount to 1,625 acres of the high sensitivity zone (1.9 percent of the total), 2,008 acres of the medium sensitivity zone (2.4 percent of the total), and 875 acres of the low sensitivity zone (4.4 percent of the total). Significant cultural resources are not expected to be present in the low sensitivity zone. The APE for Alternative B2 (Table 4.9-3) includes 7,518 acres of high sensitivity (8.7 percent of the total), 6,709 acres of medium sensitivity (8.2 percent of the total), and 1,095 acres of low sensitivity (5.6 percent of the total). Cultural resource inventories of 15,322 acres would be required for Alternative B2.

4.9.2.5 Alternative C1

Alternative C1 would result in less ground disturbance and potential direct impacts to significant cultural resources than the Proposed Action. Impacts would also be restricted to smaller geographic area. Acres disturbed during construction (Table 4.9-1) amount to 1,389 acres of the high sensitivity zone (1.6 percent of the total), 1,894 acres of the medium sensitivity zone (2.3 percent of the total), and 496 acres of the low sensitivity zone (2.5 percent of the total). Significant cultural resources are not expected to be present in the low sensitivity zone. The APE for Alternative C1 (Table 4.9-3) includes 6,213 acres of high sensitivity (7.2 percent of the total), 5,825 acres of medium sensitivity (7.1 percent of the total), and 603 acres of low sensitivity (3.1 percent of the total). Cultural resource inventories of 12,642 acres would be required for Alternative C1.

4.9.2.6 Alternative C2

Alternative C2 would result in more ground disturbance and potential direct impacts to significant cultural resources than the Proposed Action, even though impacts would be restricted to a smaller geographic area. Acres disturbed during construction (Table 4.9-1) amount to 1,805 acres of the high sensitivity zone (2.1 percent of the total), 2,616 acres of the medium sensitivity zone (3.2 percent of the total), and 897 acres of the low sensitivity zone (4.6 percent of the total). Significant cultural resources are not expected to be present in the low sensitivity zone. The APE for Alternative C2 (Table 4.9-3) includes 8,648 acres of high sensitivity (10 percent of the total), 9,035 acres of medium sensitivity (11 percent of the total), and 1,106 acres of low sensitivity (5.6 percent of the total). Cultural resource inventories of 18,789 acres would be required for Alternative C2.

4.9.2.7 No Action Alternative

The No Action alternative would still result in ground disturbance and potential direct impacts to significant cultural resources, principally from transportation corridors crossing federal lands. Acres disturbed during construction (Table 4.9-1) amount to 998 acres of the high sensitivity zone (1.2 percent of the total), 678 acres of the medium sensitivity zone (0.8 percent of the total), and 234 acres of the low sensitivity zone (1.2 percent of the total). Significant cultural resources are not expected to be present in the low sensitivity zone. The APE for the No Action alternative (Table 4.9-3) includes 4,355 acres of high sensitivity (5 percent of the total), 1,872 acres of medium sensitivity (2.3 percent of the total), and 261 acres of low sensitivity (1.3 percent of the total). Cultural

resource inventories of 6,488 acres would be required for the No Action alternative.

4.9.3 Impacts Summary

Construction of any of the alternatives would result in direct and indirect impacts to significant cultural resources, with the greatest impacts to cultural resources expected under Alternative A (Table 2.7-2). Direct and indirect impacts to significant cultural resources would be mitigated through implementation of a PA, which includes the Environmental Protection Measures presented in Section 2 and the additional mitigation measures proposed in Section 4.9.4, below. The implementation of these measures should result in an overall increase in knowledge regarding prehistoric and historic occupation of the Project Area because of the large-scale cultural resource studies that would be an outcome of project development.

4.9.4 Mitigation

In addition to the implementation of the EPMs outlined in Section 2, potential adverse effects to significant cultural resources resulting from direct or indirect project impacts would be mitigated through the development and implementation of a Cultural Resources Management Plan (CRMP). RGC, in consultation with the BLM, would develop the CRMP prior to any additional construction activities by RGC. The CRMP would address the potential effects of the entire project on historic properties. The CRMP would identify all known historic properties in the APE and probable site types that may be located, the nature of the effects to which each property would be subjected, and the treatment strategies proposed to minimize or mitigate the effects of the undertaking. The CRMP would include, at a minimum, the following elements:

- A research design that addresses important questions for the key periods of occupation or traditions represented in the sites in the Project Area.
- Suggested means of informing the public of the research in a manner that does not endanger the resource.
- Procedures for consulting with any interested persons or affected Indian tribes on issues that may involve historic properties.
- The means by which sensitive information concerning historic properties would be kept confidential.
- The means by which RGC would educate work crews as to the sensitivity of cultural resources, the protection they are afforded, and their responsibilities to avoid disturbance to sites and to report any discoveries during construction activities.
- Procedures for addressing previously unknown properties encountered during construction.
- Procedures for addressing the discovery of human remains, including consultation with federal and state officials and the appropriate American Indian Groups.

The CRMP would include provisions for determining potential effects on previously recorded historic properties located within the APE of the proposed project or properties located by the identification and evaluation activities undertaken as part of the project. The CRMP would address the potential indirect impacts to historic properties located

in the APE and would address possible mitigation measures including, but not limited to, public and work crew education, increased on-site presence by local interested groups or citizens, monitoring during construction, site review at scheduled intervals, data standards, data recovery, and a summary at the end of the project. The CRMP would also address the option of allowing public access to a site after appropriate studies have been conducted. The BLM, RGC, and the SHPO would work together to determine the most feasible means of mitigating potential indirect impact.

The CRMP would address means of mitigating impacts to traditional cultural properties, if any are identified in the APE. These means may include time use restrictions, landscaping and replanting, project or site blessing, and relocation of project elements. American Indian groups would be consulted to determine appropriate mitigation measures.

4.9.5 Unavoidable Adverse Impacts

Most adverse effects to cultural resources would be mitigated. It is possible, however, that inadvertent destruction of some cultural resources may occur. In addition, archaeological data recovery (excavation) of a cultural resource site is an irretrievable commitment of a non-renewable resource. Because significant archaeological sites would be managed for their information potential, the number of historic properties in the

Project Area available for conservation management may be reduced. Data recovery also lessens or destroys a site's public value, making it worthless for public education as an archaeological interpretive site. Furthermore, current archaeological techniques do not recover and analyze all data contained on a site. Any cultural resources excavated now would no longer be available for study when new archaeological techniques are employed in the future.

4.10 LAND USE

4.10.1 Introduction

The following types of land use impacts are discussed in this section of the EIS:

- Direct removal or loss of lands currently used for agriculture and industrial uses during the life of the project. Direct impacts to existing land uses could occur in areas required for roads, production wells, pipelines, compressor stations, and injection wells. These would be short or long-term impacts.

- Direct impacts to land use operations due to the presence of project facilities, such as changes to agricultural operations. Operational impacts would be long-term effects.

  Conflicts with rural residential and community areas due to the presence of truck traffic, dust, noise and visual impacts. Project facilities and activities may create impacts to other existing or planned uses due to secondary effects of increased dust, traffic, noise, and visual changes. The proximity of the project facilities to residential, recreational or public community uses and the presence or absence of topographic barriers would largely determine the degree to which land use incompatibility effects occur. These impacts may be short or long-term.

- Nonconformity with adopted plans and policies of federal, state and local agencies. Consistency with land use plans and regulations is evaluated in accordance with the adopted plans, policies, guidelines, and regulations of federal, state, and local agencies.

- Impacts associated with project-related vehicle traffic on Project Area highways and local roads. Vehicle trips associated with the proposed project include worker commute trips, well maintenance/workover trips, and trucks hauling construction materials and other supplies to the CBM development area. Transportation impacts would be described in the context of current traffic on Project Area roads and the capacity of those roads to handle the additional project-related traffic.

- Impacts of project-related using county roads for access to the CBM development area and the potential cost to the county road special service districts.

Recreation and grazing issues are discussed in Sections 4.11 and 4.12, respectively.

Significance Criteria

Impacts to land uses are considered potentially significant and unmitigable if the project directly impacts residential or agricultural areas with split estate mineral/surface ownership and the surface owner is not able to negotiate a satisfactory surface use plan.

Impacts to land uses are considered potentially significant, and mitigable, if the project impacts residential or agricultural areas with surface and subsurface land ownership. Landowner agreements would be secured in this setting to the satisfaction of the landowner and RGC. In these areas, landowners would negotiate agreements and compensation with RGC regarding the placement, construction, and operation of CBM facilities.

Impacts to residential areas would be significant and potentially unmitigable where the CBM wells are located on private or state mineral estate lands within 500 feet of a rural residence due to the land use incompatibility of rural residential uses with the industrial noise, traffic, dust, safety hazards, and visual effects of CBM facilities.

Impacts to residential areas would be significant where the CBM wells are located within 0.5 mile of a rural residence with unobstructed views to the proposed facilities due to the land use incompatibility of rural residential uses with the industrial noise, traffic, dust, and visual effects of CBM facilities.

Land use compatibility impacts to residential areas may vary from significant to slightly adverse in areas where the CBM facilities are located within a middleground distance zone (0.5 to 4.0 miles). Degree of impact would vary depending upon distance, topographic, and vegetation conditions, as well as the number and type of facilities that would be constructed and operated and maintained.

Impacts to planned land uses would be significant if the project directly conflicts with the management goals and objectives of the Carbon County and Emery County general plans and Carbon County Trails Plan. Impacts to the Gordon Creek Wildlife Management Area would be significant if the project substantially diminishes the resource values for which the management area was established to conserve.

With respect to transportation, impacts associated with project-related traffic on highways and local roads would be significant if project-related traffic were to exceed the actual traffic capacity of those roads. Impacts on county road districts associated with increased maintenance costs would be significant if the increase in maintenance costs were to exceed payments or royalties received by those districts from the project.

Environmental Protection Measures

Environmental protection measures that would be followed to reduce land use-related impacts include RGC-1, RGC-4, RGC-6, RGC-7, RGC-10, RGC-12, RGC-13, BLM-46, and BLM-47.

4.10.2 Direct and Indirect Impacts

4.10.2.1 Proposed Action

Land Status and Administration

Lands under the jurisdiction of the BLM and State of Utah, and private lands of Carbon and Emery counties, are shown according to surface status on Plate 1. Table 2.2-1 lists the acres of short-term and long-term disturbance by each facility type and ownership/administration that would occur from the Proposed Action. The Proposed Action would affect approximately 2,211 acres of BLM lands, 334 acres of UDWR lands, 616 acres of the State Trust lands, and 934 acres of private lands.

Agriculture

The Proposed Action would have short-term impacts on approximately 191 acres of irrigated agriculture during construction, and long-term effects on 117 acres. Table 4.10-1 identifies the short-term and long-term impacts to irrigated agriculture by type of proposed facility. Impacts to agriculture would include the permanent loss of land from production, reduced productivity in construction areas due to soil compaction from heavy equipment operations, and modifications to equipment operations. Overall, the project would affect approximately 1.0 percent of the irrigated agriculture in the Project Area. Approximately 8 acres of agriculture may be significantly impacted short-term in split-estate surface/ subsurface ownership areas. Long-term impacts to agriculture in these areas is estimated at 4 acres.

Residential and Community Uses

The Price CBM Project would avoid physically impacting the communities of Price, Carbonville, Spring Glen, Wellington, and Elmo due to the distance between the proposed facilities and these towns. Land use incompatibility impacts would result from increased noise, dust, traffic, and visual changes where the CBM facilities and activities are within foreground (up to 0.5 mile) to middleground distances (up to 4 miles) of existing residential land uses. These types of direct impacts to residents would primarily occur west and south of Price, northwest of Price along Gordon Creek Road, and west of Elmo, where the project facilities would be located in dispersed residential/agricultural areas.

In these areas, CBM facilities would be within 0.5 mile, and potentially within 200 feet of homes. Truck traffic from construction and operation activities would pose increased safety hazards to children and pedestrians. Hazards to residents would also be created by construction activities and equipment, including drilling rigs, road graders, etc., and by production well operations. These impacts are considered significant and mitigable in areas directly affected where private landowners control both

surface and subsurface minerals and, therefore, can negotiate lease terms with RGC as necessary. In total, the proposed Action would physically affect 9 acres of residential lands during construction and 6 acres long-term. Direct impacts to split estate lands are considered potentially unmitigable due to the restricted rights of landowners and the non-binding nature of suggested mitigation measures described therein. These types of physical impacts would potentially occur on two acres of land proposed for CBM facilities.

Consistency with Land Use Plans and Controls

The proposed project is consistent with the existing PRRA MFP (USDI, BLM 1984a), and subsequent Environmental Assessment Supplement on Cumulative Impacts on Oil and Gas Categories (USDI, BLM 1988a. All operations proposed by RGC would be conducted in full compliance with the terms and conditions of the MFP and federal and state lease stipulations.

Conflicts with potential mining activities are not anticipated. The coals within the Project Area are currently uneconomical to mine, due to both depth and current pricing structures for subbituminous coals. In addition, the removal of methane and water from the coalbeds may be beneficial to the mine lessee, should mining become feasible in the future.

The Proposed Action would be consistent with the State of Utah's policies regarding state trust lands, which are aimed at obtaining the greatest possible monetary return for the trust consistent with sound management practices, and managing trust lands for their highest and best use.

The proposed project would not be consistent with the overall purpose and management objectives of the Gordon Creek Wildlife Management Area land management plan. The management goals of the plan include habitat, wildlife, and recreation elements, with emphasis on achieving and maintaining optimum population levels for deer, elk, and moose. Under the Proposed Action, wells and roads would be located throughout the wildlife management area, and would have significant impacts to wildlife (Section 4.7). UDWR would require mitigation for both direct and indirect impacts as described in Section 2.2.5.3.

The proposed project would also be inconsistent with the recently adopted "Carbon County Trails Plan" which will be an appendix to the Carbon County Comprehensive Plan. As noted previously, the Carbon County Comprehensive Plan is in the draft stage and has not been adopted at this time. Several of the trails identified in the plan would be used for project traffic vehicles and transport of construction equipment and machinery.

The proposed project is consistent with the land use master plans and zoning guidelines established by Carbon County and Emery County within the overall Project Area. In Carbon County, oil and gas drilling is allowed within all zones of the county. Gas production wells are a permitted, nonconditional use in all zones within the Project Area, and no special use permit is required. ROW permits would be required from the county where pipelines are located within or across county road ROWs. The pipeline developer would need to fill out a permit application and post a bond for three years.

Transportation

Project-related traffic would consist of both worker commute trips from their homes to the active portion of the CBM development area, and truck trips associated with the hauling of

various materials and supplies. For the Proposed Action, it is estimated that there would be a maximum of 120 commuter round trips per day during the active construction period from May to November. It is assumed that many project workers would ride together and use pickup trucks and other four wheel drive vehicles to commute to the active part of the project site. Workers would not be shuttled by RGC to the project site by bus or other types of high occupancy vehicles (e.g., van). In addition, approximately 110 truck trips per day would occur during the height of the construction season.

As a part of routine CBM field operation and maintenance, each CBM well would receive a maintenance visit about once every three days. Generally, crews average about two wells per trip. It is estimated that a maximum of 100 truck trips per day would occur at project peak, when all 601 of the proposed CBM wells would be in operation. It is important to note that the 100 maintenance trips per day would be distributed throughout the development area, rather than concentrated in a specific area, as would be the case for the construction phase trips. Over time, as CBM wells would go out of production, the number of daily maintenance trips would also decline in the project area.

Since there would be an overlap between the construction and operations phases, the total volume of traffic in the project area could be as high as 330 trips per day at project peak(230 construction trips plus 100 maintenance trips).

Based on review of current traffic data on Project Area highways and roads, these project-related trips are not expected to cause traffic volumes to exceed the capacity of the road network. In some locations, trucks could cause minor traffic delays, but this type of impact would be less than significant.

The increased use of county roads by project workers and trucks to access the CBM development area would increase road maintenance costs. In Carbon County, the government agency that has responsibility for building, improving, and maintaining these roads is the Carbon County Roads Special Service District. In Emery County, this responsibility rests with the Emery County Special Service District #1. Although future project activities would increase the need for maintenance on county roads, and that maintenance may increase costs borne by the two county road districts, considerable mineral lease royalty payments would be made by RGC that would be allocated to those districts. Based on projected royalty payments, it is estimated that project-related royalty revenue would vastly exceed any increased costs that would be borne by the road districts for maintaining impacted county roads (Semken 1995).

4.10.2.2 Alternative A

Land Status and Administration

Short-term and long-term disturbances to federal BLM, State of Utah, and private lands are summarized on Table 2.3-1. Alternative A would affect approximately 3,048 acres of BLM lands, 1,413 acres of State land, and 1,285 acres of private lands. Permitting and regulatory requirements associated with the various agencies is the same as described for the Proposed Action.

Agriculture

Table 4.10-1 summarizes the short-term and long-term impacts to agriculture that would result from the implementation of

Alternative A. Total short-term and long-term impacts to agriculture are estimated to be 287 and 188 acres, respectively. Potentially significant impacts on split estate agricultural lands include approximately 13 acres disturbed during construction and 8 acres lost during the life of the project. Impact issues are the same as described previously for the Proposed Action. Overall, Alternative A would impact approximately 1.7 percent of the agriculture within the Project Area.

Residential and Community Uses

Impacts to residential and community areas would be similar to those described for the Proposed Action. Alternative A would have a greater impact on rural residential areas due to the increased density of wells (i.e., 80-acre versus 160-acre well spacing), as compared to the Proposed Action. In total, Alternative A would physically affect 14 acres of residential lands during construction, and 9 acres during the life of the project.

Consistency with Land Use Plans and Controls

The consistency of this alternative with federal, state, and local plans would be similar as described for the Proposed Action. The increased density of wells for Alternative A would result in greater conflicts with the Gordon Creek Wildlife Management Area goals and objectives.

Transportation

Since this alternative would substantially increase the number of CBM wells and associated roads, impacts to the transportation system would be greater than described for the Proposed Action. For Alternative A, up to 212 commuter round trips per day are projected during the active construction period. In addition, approximately 160 truck trips per day would occur during the height of the construction season. For routine maintenance of producing CBM wells (workovers), up to 184 truck trips per day could occur at project peak. In total, about 556 trips per day could occur at project peak (372 construction trips plus 184 maintenance trips). Despite this increase in traffic relative to the Proposed Action, review of current traffic data on Project Area highways and roads show that these project-related trips are not expected to cause traffic volumes to exceed the capacity of the road network. In some locations, trucks could cause minor traffic delays, but this type of impact would be less than significant.

The increased use of county roads by project workers and trucks to access the CBM development area would increase road maintenance costs. This substantially more intensive project alternative would likely increase the severity of road wear impacts and increase maintenance costs to the county road districts. Considerable mineral lease royalty payments would be made by RGC that would be allocated to those districts. These royalties would be even greater than described for the Proposed Action due to increased gas production. Based on projected royalty payments, it is estimated that project-related royalty revenue would vastly exceed any increased costs that would be borne by the road districts for maintaining impacted county roads.

4.10.2.3 Alternative B1

Land Status and Administration

Short-term and long-term disturbances to federal BLM, State of Utah, and private lands are summarized on Table 2.4-1. Alternative B1 would affect approximately 1,401 acres of

BLM lands, 262 acres of UDWR lands, 589 acres of the State Trust land, and 889 acres of private lands. Permitting and regulatory requirements associated with the various agencies is the same as described for the Proposed Action.

Agriculture

Impacts to agriculture would be the same as for the Proposed Action.

Residential and Community Uses

Impacts to residential and community areas would be the same as described for the Proposed Action. Alternative B1 would have similar impacts on rural residential areas as the Proposed Action.

Consistency with Land Use Plans and Controls

The consistency of this alternative with federal, state, and local plans would be similar to the Proposed Action. This alternative would impact less acreage of the Gordon Creek Wildlife Management Area, resulting in fewer conflicts with the management goals of this designated area. There would be no development in the southeastern and south-central portions of the area, but wells would be placed in several security areas.

Transportation

This alternative would decrease the number of CBM wells and associated roads by about 30 percent, relative to the Proposed Action. Thus, impacts to the transportation system are projected to be smaller than described for the Proposed Action. For the Alternative B1, about 90 commuter round trips per day are projected during the active construction period. In addition, approximately 75 truck trips per day would occur during the height of the construction season. For routine maintenance/workovers of producing CBM wells, up to 73 truck trips per day could occur at project peak. In total, about 238 trips per day could occur at project peak (165 construction trips plus 73 maintenance trips). These project-related trips are not expected to cause traffic volumes to exceed the capacity of the road network.

The increased use of county roads by project workers and trucks to access the CBM development area would increase road maintenance costs. This less intensive project alternative would likely result in less road wear impacts and maintenance costs to the county road districts, relative to the Proposed Action. Mineral lease royalty payments that would be made by RGC and allocated to the county road districts would exceed costs that would be borne by those districts for maintaining impacted county roads.

4.10.2.4 Alternative B2

Land Status and Administration

Short-term and long-term disturbances to federal BLM, State of Utah, and private lands are summarized on Table 2.4-3. Alternative B2 would affect approximately 1,933 acres of BLM lands, 318 acres of UDWR lands, 996 acres of State Trust lands, and 1,239 acres of private lands. Permitting and regulatory requirements associated with the various agencies is the same as described for the Proposed Action.

Agriculture

Impacts to agriculture would be the same as for Alternative A.

Residential and Community Uses

The types of impacts to residential and community areas would be the same as described for the Proposed Action. Alternative B2 would have a greater impact on rural residential areas due to the increased density of wells (i.e., 80 acre versus 160 acre well spacing), as compared to the Proposed Action and Alternative B1.

Consistency with Land Use Plans and Controls

The consistency of this alternative with federal, state and local plans would be similar to Alternative A, except for the Gordon Creek Wildlife Management Area, with which Alternative B2 would conflict less. There would be no development in the southeastern or south-central portions of the area, but wells would be placed in several security areas.

Transportation

Since this alternative would increase the number of CBM wells and associated roads by approximately 18 percent, impacts to the transportation system would be greater than described for the Proposed Action. For Alternative B2, about 160 commuter round trips per day are projected during the active construction period. In addition, approximately 130 truck trips per day would occur during the height of the construction season.

For routine maintenance/workovers of producing CBM wells, up to 139 truck trips per day could occur at project peak. In total, about 429 trips per day could occur at project peak (290 construction trips plus 139 maintenance trips). Despite this increase in traffic relative to the Proposed Action, these project-related trips are not expected to cause traffic volumes to exceed the capacity of the road network. In some locations, trucks could cause minor traffic delays, but this type of impact would be less than significant.

The increased use of county roads by project workers and trucks to access the CBM development area would increase road maintenance costs. This more intensive project alternative would likely increase the severity of road wear impacts for the areas developed and increase maintenance costs to the county road districts. Mineral lease royalty payments that would be made by RGC and allocated to the county road districts would exceed costs that would be borne by those districts for maintaining impacted county roads.

4.10.2.5 Alternative C1

Land Status and Administration

Short-term and long-term disturbances to BLM, state, and private lands are summarized on Table 2.5-1. Alternative C1 would impact approximately 2,018 acres of BLM lands, 230 acres of UDWR lands, 617 acres of State Trust lands, and 914 acres of private lands. Permitting and regulatory requirements associated with the various agencies is the same as described for the Proposed Action.

Agriculture

Table 4.10-1 summarizes the short-term and long-term impacts to agriculture that would result from the implementation of Alternative C1. Total short-term and long-term impacts to agriculture are estimated to be 188 acres and 115 acres, respectively. Potentially significant impacts to split-estate agriculture lands include 7 acres during construction and 4 acres long-term. Impact issues are the same as described previously for the Proposed Action. Alternative C1 would affect approximately

1.0 percent of the agriculture in the Project Area.

Residential and Community Uses

The types of impacts to residential and community areas would be the same as described for the Proposed Action.

Consistency with Land Use Plans and Controls

The consistency of Alternative C1 with federal, state, and local plans would be similar to the Proposed Action. This alternative would present fewer conflicts with the wildlife management goals and objectives of the Gordon Creek Wildlife Management Area since big game security areas on both federal and UDWR lands would be avoided. This is discussed in further detail in Section 4.7.

Transportation

This alternative would decrease the number of CBM wells and associated roads by about eight percent, relative to the Proposed Action. Thus, impacts to the transportation system are projected to be smaller than described for the Proposed Action. For Alternative C1, 110 commuter round trips per day are projected during the active construction period. In addition, approximately 95 truck trips per day would occur during the height of the construction season. For routine maintenance/ workovers of producing CBM wells, up to 92 truck trips per day could occur at project peak. In total, about 297 trips per day could occur at project peak (205 construction trips plus 92 maintenance trips). These project-related trips are not expected to cause traffic volumes to exceed the capacity of the road network.

The increased use of county roads by project workers and trucks to access the CBM development area would increase road maintenance costs. This less intensive project alternative would likely result in less road wear impacts and maintenance costs to the county road districts, relative to the Proposed Action. Mineral lease royalty payments that would be made by RGC and allocated to the county road districts would exceed costs that would be borne by those districts for maintaining impacted county roads.

4.10.2.6 Alternative C2

Land Status and Administration

Short-term and long-term disturbances to BLM, state, and private lands are summarized on Table 2.5-3. Alternative C2 would impact approximately 2,787 acres of BLM lands, 280 acres of UDWR lands, 1,307 acres of State Trust lands, and 1,286 acres of private lands. Permitting and regulatory requirements associated with the various agencies is the same as described for the Proposed Action.

Agriculture

Table 4.10-1 summarizes the short-term and long-term impacts to agriculture that would result from the implementation of Alternative C2. Total short-term and long-term impacts to agriculture are estimated to be 284 acres and 186 acres, respectively. Potentially significant impacts to split-estate agriculture lands include 13 acres during construction and 8 acres long-term. Impact issues are the same as described previously for the Proposed Action. Alternative C2 would affect approximately 1.6 percent of the agriculture in the Project Area. Comparatively, this alternative would have greater impacts than the Proposed Action or Alternatives A, B1 or C1, due to the 80 acre well spacing of Alternative C2.

Residential and Community Uses

The types of impacts to residential and community areas would be the same as described for the Proposed Action. Overall impacts would be more intense in residential areas, due to the 80-acre well spacing allowed by Alternative C2.

Consistency with Land Use Plans and Controls

The consistency of Alternative C2 with federal, state, and local plans would be similar to the Proposed Action. This alternative would present fewer conflicts with the wildlife management goals and objectives of the Gordon Creek Wildlife Management Area, since big game security areas on both federal and UDWR lands would be avoided.

Transportation

Since this alternative would increase the number of CBM wells and associated roads by approximately 69 percent, impacts to the transportation system would be greater than described for the Proposed Action. For Alternative C2, approximately 195 commuter round trips per day are projected during the active construction period. In addition, approximately 150 truck trips per day would occur during the height of the construction season. For routine maintenance/workovers of producing CBM wells, up to 168 truck trips per day could occur at project peak. In total, about 513 trips per day could occur at project peak (345 construction trips plus 168 maintenance trips). Despite this increase in traffic relative to the Proposed Action, these project-related trips are not expected to cause traffic volumes to exceed the capacity of the road network. In some locations, trucks could cause minor traffic delays, but this type of impact would be less than significant.

The increased use of county roads by project workers and trucks to access the CBM development area would increase road maintenance costs. This more intensive project alternative would likely increase the severity of road wear impacts for the areas developed and increase maintenance costs to the county road districts. Mineral lease royalty payments that would be made by RGC and allocated to the county road districts would exceed costs that would be borne by those districts for maintaining impacted county roads, however.

4.10.2.7 No Action Alternative

Land Status and Administration

Short-term and long-term disturbances to federal BLM, State of Utah, and private lands are summarized on Table 2.5-1. The No Action alternative would affect approximately 349 acres of BLM lands, 238 acres of UDWR land, 197 acres of State land, and 794 acres of private lands. Under this alternative, no additional BLM lands would be leased for production, however, ROWs would be granted for access to state and private lands.

Agriculture

Table 4.10-1 summarizes the short-term and long-term impacts to agriculture that would result from the implementation of the No Action alternative. Total short-term and long-term impacts to agriculture are estimated to be 169 and 107 acres, respectively. Potentially significant impacts during construction and operation to split-estate agricultural lands would be 4 acres and 3 acres, respectively. Impact issues are the same as described previously for the Proposed Action. Overall, the No Action alternative would impact approximately 1.0 percent of the agriculture within the Project Area.

Residential and Community Uses

Impacts to residential and community areas would be the similar for the No Action alternative as previously described for the Proposed Action. The No Action alternative would have slightly less impacts on rural residential areas due to the decreased level of production that this alternative would permit.

Overall, significant impacts to residential and community land uses would still occur where CBM facilities are constructed within foreground distances of several residences due to increased noise, dust, traffic, and visual effects. These impacts would primarily occur northwest of Price, along Gordon Creek Road, west and south of Price and west of Elmo.

Consistency with Land Use Plans and Controls

Under this alternative, BLM lands would be used primarily for providing access to other private and state lands that would still be developed. No wells or other ancillary facilities would be constructed on BLM lands. The consistency of the No Action alternative would be similar to the Proposed Action. This alternative would impact less acreage of the Gordon Creek Wildlife Management Area. Although wells would be placed in several security areas, there would be little development in the southern half of the area.

Transportation

The No Action alternative would decrease the number of CBM wells and associated roads by about 62 percent, relative to the Proposed Action. Thus, impacts to the transportation system are projected to be considerably smaller than described for the Proposed Action. For the No Action alternative, about 50 commuter round trips per day are projected during the active construction period. In addition, approximately 50 truck trips per day would occur during the height of the construction season. For routine maintenance/workovers of producing CBM wells, up to 38 truck trips per day could occur at project peak. In total, about 138 trips per day could occur at project peak (100 construction trips plus 38 maintenance trips).These project-related trips are not expected to cause traffic volumes to exceed the capacity of the road network.

The increased use of county roads by project workers and trucks to access the CBM development area would increase road maintenance costs. This less intensive project alternative would likely result in less road wear impacts, relative to the Proposed Action. As has been the case in the past, it is likely that RGC would maintain county roads accessing state and private lands under this alternative. Since no federal lands would be developed under this alternative, no mineral lease royalty payments would be allocated to the county road districts.

4.10.3 Impact Summary

The impacts of the CBM alternatives on land use are summarized and compared by alternative in Table 2.7-2. Overall, each of the alternatives, including the No Action alternative, would directly impact agricultural land and be incompatible with existing rural residential areas. In addition, all the alternatives, including the No Action alternative, would have potentially significant impacts on residential and community areas that would lie within 0.5 mile of CBM construction and operations and related traffic, noise, dust, and visual effects. Depending on the setting (including topography, vegetation, and other land uses) and number of facilities

built, significant incompatibility effects may extend beyond 0.5 mile. Impacts to agriculture and community/residential areas are considered potentially significant and unmitigable in areas of "split-estate" ownership (i.e., private surface and BLM or state subsurface mineral ownership). The greatest impacts would occur from Alternatives A, B2, and C2, which provide for 80-acre spacing of wells on private and state lands. Impacts for Alternatives B1 and C1 would be very similar to the Proposed Action, while the No Action would have the least (but still potentially significant) impacts. The increased density of well sites, associated with these alternatives would substantially increase the impacts to agricultural and grazing activities, when compared to the Proposed Action, Alternative B1, and the No Action alternative. These alternatives would also result in the greatest degree of land use incompatibility with residential uses that would be within 0.5 mile of project facilities or activities. The No Action alternative would also result in significant conflicts with agriculture and commercial/residential areas.

All alternatives would conflict with the Carbon County Trails Plan and the Gordon Creek Wildlife Management Area Plan. Impacts would be reduced for Alternatives B1, B2, and the No Action alternative for conflicts with both plans. However, Alternatives C1 and C2 would have the least conflicts with the Gordon Creek Wildlife Management Area Plan.

Although the Proposed Action and project alternatives would increase automobile and truck traffic on Project Area highways and roads, projected traffic volumes would not exceed the capacity of the transportation network. In general, for alternatives that would include development on federal lands, mineral lease royalty payment would exceed increased road maintenance costs that would be borne by the county road districts. For the No Action alternative, it is likely that RGC would assume responsibility for maintenance on county roads, as it has in the past.

4.10.4 Mitigation

The following additional mitigation recommendations would further reduce potential impacts to existing land uses and incompatibilities between the project activities and residential areas:

- Prior to construction, RGC should prepare an employee/contractors manual that describes the procedures that would be followed in the field to reduce conflicts with agricultural and grazing lands, residential areas, and other community uses. This manual should be made part of employee/contractor job descriptions/requirements. On private lands with "split estate" ownership, consultations with surface landowners should occur prior to final well design to discuss specific landowner concerns, such as potential effects to equipment operations, land use options, and land fragmentation. RGC should coordinate with the landowners to the degree possible to minimize impacts to surface use and long-term use options. Impacts may remain significant and unmitigable in "split estate" areas.

- Project-related activities in residential areas should be avoided by using alternate roads, whenever possible. In residential areas that cannot be avoided, vehicular traffic should be kept to a minimum and truck/ vehicle speeds reduced to 15 to 20 mph. Adequate signage, including stop signs and signs identifying truck traffic

should be installed on all local residential roads, as well as nearby highways.

4.10.5 Unavoidable Adverse Effects

Unavoidable adverse effects include long-term impacts to existing grazing and agricultural lands resulting from the permanent removal of land from these uses for CBM facilities. Unavoidable impacts would also include dust, noise, traffic, and visual effects from facility construction and operations to existing residential areas due to the presence of project facilities and activities. The industrial character of project activities and facilities would change the rural and undeveloped quality of life currently afforded in rural residential areas. Unavoidable effects are considered significant in agricultural and residential split-estate areas and in residential areas where CBM facilities would be on private and/or state lands within 0.5 mile.

4.11 LIVESTOCK MANAGEMENT

4.11.1 Introduction

The types of impacts that may be associated with the Price CBM Project include:

- Vegetation disturbance resulting in a reduction in the carrying capacity of the allotments. The construction of roads, wellpads, pipelines, evaporation ponds, compressor sites and other ancillary facilities would reduce the amount of forage available to livestock and cause an overall decrease in livestock production, as indicated by a loss in AUMs. Noxious weeds may be introduced or spread in the allotments due to land disturbance which may provide an opportunity for weeds to establish themselves.
- An increase in vehicular traffic from the general public and from the construction and maintenance of roads, wellpads, and other facilities which may result in livestock management problems, and the effects of seasonal road closures on livestock operators access to the allotments.
- Effects to the management and control of livestock caused by the disturbance to range improvements such as fences, corrals, wells, springs, detention dams, water pipelines, and water tanks. Construction and maintenance of roads, wellpads, and other facilities would require crossing existing fencelines in most of the allotments, and would require crossing several water pipelines in two allotments.

Several environmental protection measures have been committed to by the RGC and/or required by the BLM which would reduce the potential impacts to livestock management. These measures are listed in Section 2.2.5. Measures that would apply to the grazing and range improvement resource include RGC 7, RGC 8, RGC 9, RGC 17, BLM 1, BLM 8 through 23 (reclamation measures), BLM 48 through 52 (livestock specific measures).

These protection measures are considered to be part of the project description and their implementation is assumed in the impact analysis. The measures address issues such as noxious weed control, the protection of livestock facilities, and access to grazing areas.

4.11.2 Direct and Direct Impacts

4.11.2.1 Proposed Action

Carrying Capacity

Disturbance due to the construction of roads, wellpads, and other facilities would result in a loss of available forage and a reduction in AUMs that the allotments currently support. Table 4.11-1 lists the acres of disturbance and the number of AUMs lost in each allotment for all alternatives. Approximately 2,126 acres of BLM land and 708 acres of state/private land within the allotments would be impacted during the construction phase, resulting in a loss of 146 and 48 AUMs on BLM and state/private lands, respectively. This represents about a two percent reduction in AUMs on public lands.

Approximately 1,243 acres of BLM land and 483 acres of state/private land within the allotments would be impacted during the operation phase, resulting in a loss of 86 and 30 AUMs on BLM and state/private lands, respectively. This represents about a one percent reduction in AUMs on public lands.

A loss of 195 AUMs would occur during the construction phase. The average livestock season is two and one-half months per allotment. This would equal a total of 78 cattle or its equivalent being removed from the Project Area. A total of 116 AUMs would be lost during the operational phase. This would equal 46 cattle or its equivalent being removed from the Project Area. However, on an individual allotment basis the impact for either construction or operation would be less than four cows per allotment. Allotments would be evaluated to determine if an adjustment to the grazing permit may be necessary.

Noxious weeds are discussed in Section 4.5. Due to the environmental protection measures and other regulatory controls that require strict control of the possible introduction or spread of noxious weeds, significant impacts from the spread of noxious weeds are unlikely.

Revegetation of disturbed areas is also addressed in Section 4.5. A seed mix for revegetation has been established by the BLM which would provide for forage production, among other criteria.

Traffic and Access

The construction and operation of the Price CBM project would result in an increase in traffic, both from the construction and operations traffic, and potentially from the public who may use some of the well field roads. Construction traffic, estimated to be about 230 daily trips, would be concentrated in the area being developed. Operational traffic, estimated to be about 100 daily trips, will be more spread out across the entire development area. Often, livestock may stand on, or walk across roads within the allotment. With the increase in traffic there would be more opportunity for collisions with livestock or for the livestock to be harassed by vehicles driving along the roads.

Increased vehicle traffic from the construction and operation phases, and from activities of the general public would deposit dust particles on the vegetation adjacent to the roads and well sites. This would lower the quality of the available forage for livestock in these confined areas. Increased traffic may also increase livestock management problems including gates being left open or torn down, watering and other improvements being vandalized, and harassment of livestock.

Protection measures call for livestock operators to maintain access to grazing areas at all times, regardless of seasonal road closures that may be implemented for wildlife or other resource concerns. Operators would be issued a key for closed gates if necessary to maintain their access to livestock on the grazing allotments. This measure applies to all alternatives.

Livestock Management Facilities

As described in Section 3.11, there are range improvements on allotments which are used to control livestock movement and to provide stock water. Protection measures that would be applied to all alternatives call for the protection of range improvements either by siting facilities away from them, or if avoidance is not possible, to return the facility to its original condition. Where construction or operation activity requires access across a fenceline, a gate or cattleguard will be installed and the fence braced on either side of the roadway. Approximately 350 miles of roadway would be constructed in this alternative. As more fencelines are crossed by new roads and gates installed in the fenceline, there would be more opportunity for gates to be left open and livestock to get out of the allotment.

In all alternatives except the No Action alternative, a water supply pipeline in the Poison Spring Bench and the Mohrland allotments would be crossed by proposed new roads. To ensure that these pipelines are not damaged, as required by the environmental protection measures, they may have to be excavated and buried in a protective sleeve to protect against breakage from heavy truck traffic.

4.11.2.2 Alternative A

Carrying Capacity

Approximately 2,934 acres of BLM land and 1,157 acres of state/private land within the allotments would be impacted during construction, resulting in a loss of 202 and 75 AUMs on BLM and state/private lands, respectively. This represents about a three percent reduction in AUMs on public lands.

Approximately 1,837 acres of BLM land and 722 acres of state/private land within the allotments would be impacted during the operation phase, resulting in a loss of 127 and47 AUMs on BLM and state/private lands, respectively. This represents less than a two percent reduction in AUMs on public lands.

A loss of 277 AUMs would occur during the construction phase. The average livestock season is two and one-half months per allotment. This would equal a total of 111 cattle or its equivalent being removed from the Project Area. A total of 174 AUMs would be lost during the operational phase. This would equal 70 cattle or its equivalent being removed from the Project Area. However, on an individual allotment basis the impact for either construction or operation would be less than five cows per allotment. Allotments would be evaluated to determine if an adjustment to the grazing permit may be necessary.

Traffic and Access

Types of impacts to livestock and their management caused by an increase in traffic would be the same as the Proposed Action except that the level of traffic would increase and the potential for collisions or harassment of livestock is greater. Construction traffic is estimated to be about 372 daily trips during

construction, and about 184 during operation, compared to 230 (construction) and 100 (operation) in the Proposed Action.

Livestock Management Facilities

Alternative A calls for 80-acre well spacing and a significant increase in miles of roads to be built. Approximately 514 miles of roadway would be constructed in this alternative. This would result in more cattleguards and gates being installed in fencelines, with more opportunity for gates to be left open and livestock to get out of the allotment.

4.11.2.3 Alternative B1

Carrying Capacity

Alternative B1 includes a large area, located in the western half of the Project Area, where well development activity would be excluded on public lands due to critical wildlife habitat. This would significantly decrease the amount of disturbance in the Consumers Wash, Fausett, Haley Canyon, Long Bench, Porphyry Bench, Pinnacle Bench, Wattis, North Spring, Hiawatha, and the North Huntington allotments.

Approximately 1,393 acres of BLM land and 827 acres of state/private land within the allotments would be impacted during construction, resulting in a loss of 100 and 52 AUMs on BLM and state/private lands, respectively. This represents about a 1.5 percent reduction in AUMs on public lands.

Approximately 800 acres of BLM land and 485 acres of state/private land within the allotments would be impacted during the operation phase, resulting in a loss of 58 and 30 AUMs on BLM and state/private lands, respectively. This represents less than a one percent reduction in AUMs on public lands.

A loss of 152 AUMs would occur during the construction phase. The average livestock season is two and one-half months per allotment. This would equal a total of 61 cattle or its equivalent being removed from the Project Area. A total of 88 AUMs would be lost during the operational phase. This would equal 35 cattle or its equivalent being removed from the Project Area. However, on an individual allotment basis the impact for either construction or operation would be less than three cows per allotment. Allotments would be evaluated to determine if an adjustment to the grazing permit may be necessary.

Traffic and Access

Types of impacts to livestock and their management caused by an increase in traffic would be the same as the Proposed Action, except that the level of traffic would decrease and the potential for collisions or harassment of livestock is less. Construction traffic is estimated to be about 165 daily trips during construction, and about 73 during operation, compared to 230 (construction) and 100 (operation) in the Proposed Action.

Livestock Management Facilities

Alternative B1 would restrict well development on many of the allotments because of wildlife concerns. Approximately 260 miles of roadway would be constructed in this alternative. The number of fencelines crossed by new road construction would be less than the Proposed Action, reducing the opportunity for gates to be left open and for livestock to get out of the allotment.

4.11.2.4 Alternative B2

Carrying Capacity

Alternative B2 has the same area of restricted development as B1, but in areas where field development would occur, it would be on a 80-acre well spacing, increasing the amount of development and land disturbance from the B1 levels.

Approximately 1,920 acres of BLM land and 1,080 acres of state/private land within the allotments would be impacted during construction, resulting in a loss of 138 and 69 AUMs on BLM and state/private lands, respectively. This represents about a two percent reduction in AUMs on public lands.

Approximately 1,177 acres of BLM land and 668 acres of state/private land within the allotments would be impacted during the operation phase, resulting in a loss of 86 and 42 AUMs on BLM and state/private lands, respectively. This represents about a one percent reduction in AUMs on public lands.

A loss of 208 AUMs would occur during the construction phase. The average livestock season is two and one-half months per allotment. This would equal a total of 83 cattle or its equivalent being removed from the Project Area. A total of 128 AUMs would be lost during the operational phase. This would equal 51 cattle or its equivalent being removed from the Project Area. However, on an individual allotment basis the impact for either construction or operation would be less than eight cows per allotment. Allotments would be evaluated to determine if an adjustment to the grazing permit may be necessary.

Traffic and Access

Types of impacts to livestock and their management caused by an increase in traffic would be the same as the Alternative B1 except that the level of traffic would increase and the potential for collisions or harassment of livestock would be greater. Construction traffic is estimated to be about 290 daily trips during construction, and about 139 during operation, compared to 165 (construction) and 73 (operation) in Alternative B1.

Livestock Management Facilities

Alternative B2 would restrict well development on many of the allotments because of wildlife concerns. However, the number of fencelines crossed by new road construction would be greater than for Alternative B1, increasing the opportunity for gates to be left open and for livestock to get out of the allotment. Approximately 357 miles of roadway would be constructed in this alternative.

4.11.2.5 Alternative C1

Carrying Capacity

Alternative C1 would restrict well development in scattered areas in the western half of the Project Area due to big game security areas. The Consumers Wash, Fausett, Haley Canyon, North Spring, Mohrland, and North Huntington allotments contain some big game security areas where development would be restricted.

Approximately 1,994 acres of BLM land and 837 acres of state/private land within the allotments would be impacted during construction, resulting in a loss of 138 and 50 AUMs on BLM and state/private lands,

respectively. This represents about a two percent reduction in AUMs on public lands.

Approximately 1,159 acres of BLM land and 480 acres of state/private land within the allotments would be impacted during the operation phase, resulting in a loss of 80 and 29 AUMs on BLM and state/private lands, respectively. This represents about a one percent reduction in AUMs on public lands.

A loss of 188 AUMs would occur during the construction phase. The average livestock season is two and one-half months per allotment. This would equal a total of 75 cattle or its equivalent being removed from the Project Area. A total of 109 AUMs would be lost during the operational phase. This would equal 44 cattle or its equivalent being removed from the Project Area. However, on an individual allotment basis the impact for either construction or operation would be less than four cows per allotment. Allotments would be evaluated to determine if an adjustment to the grazing permit may be necessary.

Traffic and Access

Types of impacts to livestock and their management caused by an increase in traffic would be the same as the Proposed Action except that the level of traffic would be slightly less. The potential for collisions or harassment of livestock would generally be the same as the Proposed Action. Construction traffic is estimated to be about 205 daily trips during construction, and about 92 during operation, compared to 230 (construction) and 100 (operation) in the Proposed Action.

4.11.2.6 Alternative C2

Carrying Capacity

Alternative C2 would restrict well development in scattered areas in the western half of the Project Area due to big game security areas, as in Alternative C1, but would have well development occurring on a 80-acre spacing, increasing the level of development from C1.

Approximately 2,748 acres of BLM land and 1,086 acres of state/private land within the allotments would be impacted during construction, resulting in a loss of 191 and 68 AUMs on BLM and state/private lands, respectively. This represents about a three percent reduction in AUMs on public lands.

Approximately 1,703 acres of BLM land and 689 acres of state/private land within the allotments would be impacted during the operation phase, resulting in a loss of 118 and 44 AUMs on BLM and state/private lands, respectively. This represents about a two percent reduction in AUMs on public lands.

A loss of 259 AUMs would occur during the construction phase. The average livestock season is two and one-half months per allotment. This would equal a total of 104 cattle or its equivalent being removed from the Project Area. A total of 162 AUMs would be lost during the operational phase. This would equal 65 cattle or its equivalent being removed from the Project Area. However, on an individual allotment basis the impact for either construction or operation would be less than five cows per allotment. Allotments would be evaluated to determine if an adjustment to the grazing permit may be necessary.

Traffic and Access

Types of impacts to livestock and their management caused by an increase in traffic would be the same as in Alternative C1 except that the level of traffic would be greater, increasing the potential for collisions or harassment of livestock. Construction traffic is estimated to be about 345 daily trips during construction, and about 168 during operation, compared to 205 (construction) and 92 (operation) in Alternative C1.

Livestock Management Facilities

Alternative C2 would restrict well development on several of the allotments because of wildlife concerns. However, the number of fencelines crossed by new road construction would be greater than the Alternative C1, increasing the opportunity for gates to be left open and for livestock to get out of the allotment. Approximately 473 miles of roadway would be constructed in this alternative.

4.11.2.7 No Action Alternative

Carrying Capacity

The No Action alternative would deny development on federal mineral estate. However, development on state and private lands would likely occur. Some disturbance would occur on public lands as a result of access roads being built to access development areas on state and private lands.

Approximately 359 acres of BLM land and 709 acres of state/private land within the allotments would be impacted during construction, resulting in a loss of 27 and 43 AUMs on BLM and state/private lands, respectively. This represents less than one-half of one percent reduction in AUMs on public lands.

Approximately 121 acres of BLM land and 433 acres of state/private land within the allotments would be impacted during the operation phase, resulting in a loss of 9 and 27 AUMs on BLM and state/private lands, respectively. This represents about a one-tenth of one percent reduction in AUMs on public lands.

A loss of 69 AUMs would occur during the construction phase. The average livestock season is two and one-half months per allotment. This would equal a total of 28 cattle or its equivalent being removed from the Project Area. A total of 36 AUMs would be lost during the operational phase. This would equal 14 cattle or its equivalent being removed from the Project Area. However, on an individual allotment basis the impact for either construction or operation would be less than two cows per allotment. Allotments would be evaluated to determine if an adjustment to the grazing permit may be necessary.

Traffic and Access

Types of impacts to livestock and their management caused by an increase in traffic would be the same as the Proposed Action except that the level of traffic would be significantly less. The potential for collisions or harassment of livestock would be greatly reduced from the Proposed Action. Construction traffic is estimated to be about 100 daily trips during construction, and about 38 during operation, compared to 230 (construction) and 100 (operation) in the Proposed Action.

Livestock Management Facilities

The No Action alternative would restrict most well development activity to state and private lands. Approximately 154 miles of roadway would be constructed in this alternative, most of which would be built outside of the established allotments. The number of fencelines crossed by new road construction would much less than the Proposed Action, reducing the opportunity for gates to be left open and for livestock to get out of the allotment.

4.11.3 Impacts Summary

A summary comparison of the Proposed Action and alternatives is provided in Table 2.7-2.

All of the alternatives would result in some reduction in carrying capacity due to disturbance of vegetation. Alternative A would result in the greatest loss in AUMs, approximately 202 on public lands and a total of 277 on all lands. The No Action alternative would result in the lowest impacts to allotment production with approximately 27 AUMs lost on public lands and about 69 total AUMs lost for all lands.

Alternatives A and C2 would require the greatest number of daily trips by construction and operation related traffic, and the No Action alternative would require the least amount of traffic. A lower traffic level would decrease the potential for livestock collisions and for the opportunity for vehicles to harass livestock.

Livestock improvements such as fences, corrals, springs, detention dams, water pipelines, and water tanks would be protected by the RGC committed or the BLM required environmental protection measures. As long as livestock improvements are avoided during the siting of facilities, or are returned to their original condition if disturbance is unavoidable, there should be little to no impacts on the control or maintenance of livestock on the allotments. If gates are installed in fencelines that need to be crossed by roads or other facilities, there is the increased possibility for gates to be left open and for livestock to get out of the allotment. Alternatives A and C2 require the greatest miles of roads to be built and would require the greatest number of fence crossings, increasing the possibility of a gate being left open. The No Action alternative would require the least amount of fence crossings.

4.11.4 Mitigation

The RGC committed to, and the BLM requires environmental protection measures that address many of the concerns related to livestock management, including control of noxious weeds, revegetation of disturbed lands to return them to productive use, and the protection of livestock management facilities such as fences and water improvements. The following additional mitigation measures would further reduce potential effects to livestock management:

- Cattleguards should be installed (to BLM weight load carrying capacity) on all high use roads to replace gates for ease of access for well equipment and workers, the general public, recreationists, and livestock operators. Using cattleguards instead of gates would reduce the possibility for gates to be left open and would improve the control of livestock movements.

- RGC should initiate vegetation enhancement projects, to improve forage value in the allotments and to compensate for the reduction in AUMs, as stipulated by the BLM or requested by private landowners.

4.11.5 Unavoidable Adverse Impacts

Disturbance to vegetation, resulting in a loss of forage production and a reduction in AUMs supported by the various allotments will occur to some extent under all alternatives. Road construction and an increase in traffic, resulting in an increased possibility of livestock accidents or harassment of livestock, would also occur under all alternatives, although the area affected would be reduced under some alternatives.

4.12 RECREATION

4.12.1 Introduction

Recreation-related impacts from the Proposed Action and alternatives may include the following:

- Engine and machine noise generated during construction and drilling and pumping operations would degrade the quality of recreational experiences for nonmotorized users. Increased truck traffic would similarly diminish the opportunity for solitude for all recreational users and reduce the quiet atmosphere enjoyed by nonmotorized users.

- The quality of recreational experiences and the availability of recreational opportunities on public BLM and state lands would be diminished over the life of the project. The visibility of project facilities and activities would change from roaded natural landscapes suited for a variety of informal recreational activities to a predominantly industrial environment.

- Increased traffic and heavy vehicles may tend to "powder" roads currently used, or planned, for mountain biking. This would make such roads less suitable for this sport, as well as increase the amount of fugitive dust that would have to be endured.

- The quality of recreational experiences would similarly be diminished at developed recreation sites located adjacent to project roads and wells.

- Impacts relating to several recreation issues would not vary by alternative, and are discussed in Section 1.6. These include restrictions of public access in winter closure areas, and impacts to the Carbon County Fairgrounds, Four-mile Rifle Range, and Pinnacle Peak Black Powder Range.

Several environmental protection measures have been committed to by RGC or required by the BLM that would reduce impacts to recreation resources. These measures are listed in Section 2.2.5 and address such issues as siting of facilities (BLM 1) and protection of visual resources (BLM 53 - 56). Other measures that would reduce impacts to wildlife and promote successful revegetation of disturbed lands would indirectly benefit recreationists as hunting, viewing wildlife and recreating in natural appearing landscapes are important elements in the recreational opportunities available in the area.

4.12.2 Direct and Direct impacts

4.12.2.1 <u>Proposed Action</u>

No Special Recreation Management Areas (SRMA), designated Wilderness Areas, or Wilderness Project Areas would be affected by the Proposed Action. Similarly, the Proposed Action would not directly impact any developed recreation areas, such as the Carbon County Country Club and Golf Course and local community park and recreation areas. The proposed project would also avoid impacting areas of highest informal recreational use, including Wood Hill and the area between Price and Kenilworth.

Impacts to recreational lands and values would occur on public lands throughout the CBM project development area. As well field development increases, the character of the landscape would change from a semi-primitive motorized and roaded natural setting to more of an industrial type of landscape.

A reduction in wildlife populations would result in a corresponding loss in hunting opportunities, and a decrease in the number of hunters. This would have an economic impact to local communities, as discussed in the Section 4.15. In total, the Proposed Action would impact approximately 3,161 acres of federal and state lands in the short-term, and 1,845 acres in the long-term.

Recreationists would be displaced to other areas not affected by mineral development. This displacement would result in greater usage in displaced areas and greater competition among hunters. Impacts of project development would also include limiting the County's options for developing and promoting mountain bike trail systems.

As mentioned in Section 3.12, Carbon County has recently approved a County Trails Plan, which includes several roads/trails that would be impacted by the Price CBM Project. The major trails that would be effected include the Pinnacle Peak/Gordon Creek/Consumers Road Loop and a loop trail in the North Spring Canyon/Horse Bench area, off the main road to Wattis. The scenic quality, and consequently, the quality of the recreational experience would be impacted as trail users viewed the CBM facilities, and as they potentially encounter well field development related traffic. As part of the project description of all alternatives, several roads within the Project Area would be seasonally closed to reduce impacts to wildlife. Closure dates are between December 1 and April 1. This would not effect the Pinnacle Peak/Gordon Creek/Consumers Road Loop since the Trails Plan also calls for restricting traffic on this loop during the same time period, also due to wildlife concerns. However, the North Spring Canyon/Horse Bench loop would be impacted by this road closure, limiting the use of the trail. The Wood Hill to Kenilworth loop is one of the heaviest used trials in the Price area and would be part of the planned county trail system. This area would not be impacted by the Price CBM Project. It is, however, impacted by the existing Helper CBM development and is in an area planned for more extensive well development. This is discussed in Chapter 5.

An increase in traffic due to field development activities would also cause a change in the recreational setting and experience. Dispersed recreational activities such as bicycling, driving for pleasure and wildlife viewing would be impacted by the increase in traffic, dust, and noise, especially during the construction phase of the project. Proposed roads to be built for the Price CBM Project include collector (higher use), local

(moderate use) and resource (lower use) roads. These roads are being designed for certain design speeds: Collector - 25 mph; local - 20 mph; and resource - 15 mph. Noise impacts would come from several sources, and would be at their highest levels during the construction phase. During operations, a compressor stations would emit noise levels up to 58-62 dBA at 500 feet. A bicyclist traveling by a compressor station would hear the noise generated from the compressor site for several minutes. See Sections 4.10 and 4.14 for more information on traffic and noise.

4.12.2.2 Alternative A

Alternative A would result in the same types of impacts reported for the Proposed Action. The intensity of impacts to informal recreational uses and quality of experiences would be greater, however, due to the denser development associated with the 80-acre spacing of production wells. Increased levels of noise, dust, and visual changes to the landscape would result as compared to the Proposed Action. Alternative A would impact approximately 4,473 (short-term) and 2,797 (long-term) acres of public BLM and state lands currently in open space.

4.12.2.3 Alternative B1

Alternative B1 would have fewer impacts on informal recreational opportunities, than the Proposed Action and Alternative A. This alternative would reduce impacts to recreation in the Porphyry Bench/Pinnacle Peak area by restricting CBM facilities to state and private lands. Indirect noise, dust, and visual changes would impact the quality of recreational experiences, since the CBM facilities and activities would be located on nearby state and private lands. In total, Alternative B1 would affect approximately 2,252 (short-term) and 1,296 (long-term) acres of federal and state lands currently in open space.

4.12.2.4 Alternative B2

Impacts on informal recreational uses would be similar to those described above for Alternative B1. This alternative would minimize impacts to the Porphyry Bench and Pinnacle Peak area by limiting CBM activities to state and private lands. Alternative B2 would provide for 80-acre well spacing, however, which would intensify the industrial nature of the CBM development on adjacent state and private lands. Consequently, the CBM project would result in greater indirect noise, dust, and visual impacts than those anticipated with Alternative B1. In total, Alternative B2 would affect approximately 3,271 (short-term) and 2,012 (long-term) acres of open space federal and state lands.

4.12.2.5 Alternative C1

Alternative C1 includes areas excluded from well development due to big game security areas. This would reduce impacts in scattered areas in the Consumers Wash, Gordon Creek, Pinnacle Bench, Serviceberry Creek, Potter Wash, and Oil Well Bench areas. Other than those excluded areas, impacts would be the same as those described in the Proposed Action, including negative effects to the recreational setting (from a natural appearing landscape to a more developed, industrial setting), to opportunities for hunting and viewing wildlife, to the quality of dispersed recreational activities such as driving for pleasure, OHV use, bicycling, and effects to the planned county trail system. In total, Alternative C1 would affect approximately 2,865 (short-term) and 1,670 (long-term) acres of federal and state lands.

4.12.2.6 Alternative C2

Types of impacts would be similar to alternative C1 except that this alternative provides for 80-acre well spacing which would greatly intensify the industrial appearance of lands in the CBM development area. Consequently, Alternative C2 would result in greater traffic, noise, dust, and visual impacts than Alternative C1. In total, Alternative C2 would affect approximately 4,070 (short-term) and 2,537 (long-term) acres of federal and state lands.

4.12.2.7 No Action Alternative

The No Action alternative would avoid impacting BLM lands with CBM facilities, however, access would be provided across BLM lands to state and private lands. As such, this alternative would limit impacts to public land recreational opportunities. Project-related indirect noise, visual, and dust would impact the quality of recreational experiences. In total, the No Action alternative would impact approximately 1,113 (short-term) and 584 (long-term) acres of federal and state lands currently in open space.

4.12.3 Impact Summary

A summary comparison of the impacts of the alternatives is provided in Table 2.7-2.

All of the alternatives would impact lands used for informal recreational pursuits including the planned county trail system. Reductions in the quality of recreational experiences would result in areas subject to increases in noise, dust, and traffic, as well as visual changes to the character of the landscape. Impacts to recreational opportunities in the CBM development area would cause displacement of persons to other areas, which in turn would increase use and hunting competition in those areas. Among the alternatives, the No Action alternative and Alternative B1 would result in the least impacts to informal recreational areas, since all would avoid high use public BLM lands near Porphyry Bench and Pinnacle Peak. Alternative A would have the greatest impact on informal recreation due to the 80-acre well spacing throughout the CBM development area.

4.12.4 Mitigation

No additional mitigation measures are recommended.

4.12.5 Unavoidable Adverse Impacts

Public lands with recreational values for hunting, wildlife viewing, horseback riding, hiking, and biking would be affected, regardless of the alternative selected. Impacts to recreation include reductions in the quality of recreational experiences afforded by public lands. These impacts would result in a displacement of recreationists to other areas in the region, thus increasing the amount of use such areas receive and competition among hunters.

4.13 VISUAL RESOURCES

4.13.1 Introduction

The visual impacts resulting from the Proposed Action and alternatives fall into the following general impact categories:

1. **Impacts to Landscape Character and Quality**. The construction and operation of the project facilities would transform significant portions of the existing Project Area landscapes from a natural to an industrial character. Character changes would result from grading

natural landforms and removing pinyon/juniper, sagescrub and grassland vegetation patterns for wells, roads, pipelines, evaporation ponds, compressor stations and electrical substations. Character changes would be most dramatic at compressor stations, injection wells and evaporation ponds due to the amount of acreage required at these sites, and the industrial appearance of these facilities. During operation, the industrial character of the landscape would be lessened, but still on-going due to both the presence of the facilities and associated truck traffic, dust and maintenance activities.

2. **Visual Impacts to Viewers.** Visual sensitivity depends upon viewer attitudes towards landscape changes and the number of viewers potentially affected. Within the Project Area, viewers sensitive to landscape and visual quality changes brought about by the project consist of local residents, persons engaging in dispersed recreational activities on public or private lands, and travelers along state highways and local thoroughfares. Visual impacts to each of these types of viewer groups would depend upon a number of factors including: distance from which the facilities are viewed; the number and type of facilities and roadways seen; and whether the facilities are screened by vegetation and/or topography or openly visible and/or skylined on ridgelines.

3. **Visual Impacts Resulting from Regional Haze and Reductions in Air Quality**. Over the past 20 years, regional visibility has diminished due to the combined influences of air pollutants and climatic conditions. Regional haze reduces both the outer limits of visible landscapes as well as the clarity and color of landscape features seen at closer ranges. The CBM project facilities will contribute to regional air quality haze due to nitrogen oxide emissions from the compressor stations. These types of impacts are discussed in the Air Quality Section (4.3).

4. **Reductions in Dark Skies and Visibility to Stars and Other Celestial Objects.** The proposed project and facilities would require night lighting at compressor stations, injection wells, evaporation ponds and drilling rigs. Flaring of gas would also impact nighttime views. Night lighting of these facilities may be visible from sensitive viewing locations and/or affect the darkness of skies and the related visibility and clarity of celestial objects.

RGC has incorporated several mitigation measures into their project description, including: dust suppression on roads and construction zones during construction and operation using magnesium chloride (RGC 1) and the undergrounding of electrical utility lines. On BLM lands, measures BLM 53 through 56 would be followed which address grading and reclamation of access roads, litter control, and conformity with VRM classes.

The visual impacts of the Proposed Action and alternatives were estimated based upon the degree of change, or contrast, that each alternative would cause to the natural landscape and to sensitive viewers. Contrast

ratings were conducted in the field from representative KOPs that served as proxies for the Project Area and viewer groups as a whole. KOPs are shown on Plate 12 and anticipated visibility conditions are shown on Plate 25. Table 4.13-1 summarizes the assessment results. The following criteria were used to determine the significance of visual impacts:

Impacts to Natural Landscapes

The amount of land dedicated to the project would vary (see Tables 2.2-1, 2.3-1,2.4-1, 2.4-3, 2.5-1, 2.5-3, and 2.6-1) by each type of facility and alternative. Cumulatively, however, any of the project alternatives would create a large-scale web of industrial facilities, activities, and roads.

Visual contrasts in line and form would be strong in almost all cases. Color and texture contrasts would range from strong to moderate. Movement of trucks and wells would also contribute to strong visual contrasts throughout the Project Area.

Impacts to landscape character were assessed according to the degree to which the composite buildout of the proposed project or alternatives would comply with the BLM's VRM classes for Project Area lands. This approach recognizes that, while individual well sites might not be visually dominant in the characteristic landscape, the cumulative effects of truck traffic, fugitive dust, and other construction/maintenance activities would be. Significant impacts were consequently identified where the project would directly impact VRM Class III or II landscapes. Landscape impacts were considered less than significant in areas designated as VRM Class IV. (See Section 3.13 for VRM Class definitions.)

Impacts to natural landscape quality would also occur and would be most evident in adjoining areas with open, low shrub/grassland vegetation cover. Within the Project Area, this type of open visibility occurs on the benches, in the agricultural valleys, and in areas with desert salt, sagebrush and grassland vegetation cover. Adjacent areas with pinyon/juniper vegetation would be less affected indirectly due to the intermittent visibility conditions afforded by this vegetation type. (See Plate 16, Vegetation.) Impacts to natural landscape amenities are considered significant where VRM Class II/III public lands would be openly visible and within 0.5 mile of project roads, compressor stations, injection wells and evaporation ponds. In these areas, project facilities and activities would still dominate the characteristic landscape. Impacts to adjacent landscapes' quality would not be significant in instances where facilities are limited to a few wells or vegetation patterns largely screen the visual influences of the project.

Impacts to Viewers

The visual contrasts of the project facilities, roads and construction/operation activities were evaluated for different viewer groups taking into consideration the distance between viewers and project facilities/activities; the amount and type of facilities/activities viewed; whether facilities would be screened or not by vegetation and/or topography; and duration of view, as reflected by viewer activity. The degree of visual contrast potentially created by the project facilities and activities in the line, form, color and texture of the viewed landscape were assessed. The degree of change in each visual element was rated according to three levels: strong, moderate and weak. The following factors

were considered in determining the significance of impacts to sensitive viewers:

Distance Zones - The intervening distance between project facilities and activities and sensitive viewers would largely determine the degree to which the project is visually evident and dominant in the seen landscape.

Within a foreground (0 to .5 mile) distance zone, the project facilities, roads, truck traffic, dust and other activities would visually dominate the landscape in most cases. Visual impacts to sensitive viewers are considered significant within this distance zone. Within middleground (.5 to 4.0 miles) distances, the project may visually dominate the seen landscape, particularly in instances where panoramic views to multiple facilities and roads are possible or where wells are visibly skylined on ridgelines.

Vegetation Cover - In general, open grassland, sagescrub, agricultural, and/or desert salt vegetation cover would provide little to no screening of project facilities and activities. These types of open, low covers predominate in the central and eastern parts of the Project Area. Significant impacts to sensitive viewers would occur where facilities and activities are proposed within foreground and middleground distance zones with these types of open settings.

Landforms - Much of the Project Area consists of a series of flat to rolling benches and open plains and valleys. Escarpments connecting these *landforms* provide landform relief and diversity in rockforms and color. Landforms largely determine the degree to which wells would be skylined on visible ridgelines or viewed as a large industrial field from elevated viewpoints. In general, significant visual impacts would occur where existing open panoramic views of the natural landscape would be transformed to views of a massive industrial scale.

Project Facilities - The CBM project facilities/activities would impose different degrees of visual change by virtue of their size, height, color, location and movement. Facilities are described and shown graphically in Section 2.2 of this EIS. During project construction, the amount of road and pipeline construction, grading, truck traffic, dust and equipment would impose strong contrasts in line, form, color, and texture at all facilities, construction well sites.

Construction-related visual impacts to sensitive viewers are considered significant for all the alternatives within foreground and middleground distance zones. Figure 4.13-1 shows photographs of typical CBM construction equipment and activities.

Following construction, the degree of visual contrast created by the project facilities would vary. Visual contrasts of compressor stations, roads, pipeline corridors, evaporation ponds and injection wells would remain strong, and significant, within foreground distance zones. Figure 4.13-2 contains photographs of compressor station facilities. Evaporation ponds and injection wells may vary in visual contrast from strong to moderate within foreground to middleground distance zones. Visual contrasts of individual well sites would range from strong to weak depending

upon distance and the degree of vegetation/landform screening. Figure 4.13-3 shows representative equipment at production well sites and along pipeline corridors. Within background distance zones, all facilities are expected to have a moderate to weak contrast, except for road systems, where fugitive dust may cause strong and highly visible contrasts within the seen landscape. Figure 4.13-4 shows existing RGC facilities from middleground and background distances.

Table 4.13-2 summarizes the degree of visual impacts expected to result to various types of sensitive viewer groups in the Project Area. Impacts are discussed below by alternative. Table 4.13-3 compares the alternatives according to the number of acres of designated VRM Classes that would be affected on Federal BLM lands. These data correspond to the classes designated by BLM in the 1970s. Table 4.13-4 summarizes how BLM Class designations would pertain to landscape values and visual sensitivities. This table summarizes the amount of area potentially impacted that lies within the foreground distance zone (0.5 mile) of residential areas, recreational sites and trails and State Highway 6/191.

4.13.2 Direct and Indirect Impacts

4.13.2.1 Proposed Action

Landscape Quality and Character

The Proposed Action would dramatically alter the existing natural landscape character of areas developed for CBM facilities. Plate 2 shows the distribution of facilities within the Project Area. Table 2.2-1 summarizes the overall amount of physical disturbance anticipated with the proposed project. Section 4.10 further describes the amount of truck traffic anticipated during project construction and operation phases. Impacts to landscape character would be greatest during construction and at 5 compressor sites (25 acres), 7 evaporation ponds (28 acres) and 7 injection wells (56 acres), along with 51 miles of pipeline routes and 350 miles of roads. In total, 601 production wells would be constructed.

Overall, approximately 2,353 acres would be permanently converted from a natural to industrial character for the proposed facilities. Approximately 4,095 acres would be disturbed during construction. The federal lands affected by the Proposed Action are currently designated as VRM Class IV (2,114 acres) or III (275 acres). The proposed project would be in conformity with Class IV VRM objectives and on state lands where no visual management objectives have been adopted. Project activities would exceed the BLM's VRM Class III management objectives for visual changes. Based on present-day conditions, the Proposed Action would affect approximately 1,793 acres that meet VRM Class II or III criteria.

Landscape and visual impacts would be greatest during construction due to the amount of disturbance anticipated and the presence of construction crews, trucks, dust, drilling rigs, etc. Cumulatively, these activities may be highly visible, depending upon specific viewing conditions, due to fugitive dust and construction equipment not subject to visual blending and painting. During operation, the intensity of visual changes would be reduced at well sites and along roadways by both the limited number of maintenance crews and trips required, as well as the painting of permanent facilities. Visual changes would remain strong at the compressor stations, evaporation ponds and injection wells,

however, due to the scale of these facilities and on-going presence of trucks, and equipment operations.

Visual Impacts to Viewers

Viewer impacts are summarized for the proposed project on Table 4.13-1 and 4.13-2. Plate 25 shows the composite visibility of Project Area lands that could be visible from several representative Key Observation Points in the Project Area. Significant visual impacts would result on local rural residential areas and recreationists using BLM public lands. Visual impacts to rural residential areas would primarily result from the presence and movement of construction equipment, grading and use of project roads, and operation of wells within foreground (0.5 mile) and middleground (0.5 to 4.0 mile) distances. Rural residential areas south and west of Price, along Gordon Creek Road, and west of Elmo would be significantly affected by movement of trucks and associated fugitive dust, construction equipment, and long-term operation and movement of production wells. Within these areas, existing rural agricultural and natural views would be transformed to landscapes of an industrial character due to presence and movement of wells, roads, vehicles, and ancillary facilities such as pipelines, manhole barricades, and electrical boxes at well sites. Viewed within a foreground distance zone, and to 200 feet from residences, these facilities would be visually dominant and significantly alter the residential settings. From middleground distances, views to multiple wells and relocated facilities and roads would also cumulatively alter the existing natural, rural character of these residential areas to a mixed industrial setting.

Visual impacts to the quality of views and recreational experiences along county designated trails west of Price would also be significant. Existing county trails along Pinnacle Creek and Bench roads would be converted and/or used as major collector roads and pipeline corridors. A compressor station and related facilities would also be located adjacent to this trail system. Other recreational areas significantly affected by foreground views to wells, trucks and fugitive dust include Consumer Wash Road, Gordon Creek Road, Horse Bench and Porphyry Bench.

Visual changes associated with the proposed project would be substantially less evident, and not significant, from Highway 6, from the communities of Price, Elmo, and Wellington, and from the Carbon County Country Club. Moderate levels of visual impact, associated with trucks, fugitive dust and well construction and operation, would occur at the fairgrounds, and along Highways 10, 122 and 155.

Regional Haze Impacts

Impacts associated with regional haze and reduced visibility are discussed in Section 4.3, Air Quality.

Night Lighting and Impacts to Dark Skies

Lights would be required at compressor stations, injection wells, evaporation ponds and on drilling rigs. Lights would be 250 watts, clear bulbs, emitting 30,000 lumens. Eight (8) lights would be required on each of the seven compressor stations, with two lights on each of the 7 injection wells and evaporation ponds. During construction, lights would be on drilling rigs, with a maximum of

four drilling rigs operating at any one time. Flaring of gas would also impact nighttime views. Lighting on permanent facilities would be mounted and directed downwards. Night lighting of drilling rigs may be intermittently visible during construction from residential areas, along travel routes and from elevated public vistas (e.g., Woodhill). Permanent lighting would have no perceivable effect on the quality of dark skies in the region.

4.13.2.2 Alternative A

Alternative A would result in the same types of impacts to landscape character and viewers. Compared to the Proposed Action, this alternative would cause greater landscape modifications for 514 miles of roads and 1103 well pads, however, due to the 80 acre spacing of production wells. Landscape disturbances and night lighting impacts at compressor sites, injection wells and evaporation ponds would be the same as for the Proposed Project. See Plate 4 and Table 2.3-1.

Visual impacts to viewers are summarized on Table 4.13-2. Impacts to rural residents and recreationists would be also be significant and greater than reported for the proposed project. Overall, Alternative A would initially disturb 5,758 acres, with 3,585 acres permanently converted to industrial production and use. Alternative A would impact approximately 402 acres of federal BLM lands designated as VRM Class III and 2,889 acres of lands designated as Class IV (Table 4.13-3). Based upon present-day conditions, approximately 2,396 acres of lands affected by Alternative A would meet VRM Class II or III standards (Table 4.13-4).

4.13.2.3 Alternative B1

Alternative B1 would result in the same types of landscape character changes and impacts to viewers as the proposed project. Plate 5 and Table 2.4-1 summarize the general location and amount of land disturbance anticipated during the construction and operation of this alternative. Table 4.13-2 summarizes the visual impacts to viewers. Alternative B1 would limit the amount of CBM development on lands west of Price. In areas restricted from development, the predominantly natural roaded character of the landscape would remain largely unchanged. These areas would still be available to the public for aesthetic enjoyment and related recreational experiences. Visual impacts to the county designated trail system would be significant, however, since portions of the trail would still be used for transportation and pipeline corridors needed for project developments occurring on nearby state lands.

In total, Alternative B1 would temporarily disturb 3,151 acres, with long-term permanent changes to 1,818 acres. Compared to the Proposed Action, this alternative would cause less disturbances for injection wells (5 sites/25 acres), evaporation ponds (5 sites/20 acres), production wells (436 wells/611 acres) and roads (260 miles). With respect to VRM Class conformity, Alternative B1 would impact approximately 215 acres of federal Class III landscapes and 1,307 acres of federal Class IV landscapes (Table 4.13-3). Based on present-day conditions, approximately 1,375 acres potentially affected by Alternative B1 would meet VRM Class II or III standards (Table 4.13-4).

4.13.2.4 Alternative B2

The visual and landscape character impacts of Alternative B2 would be similar to, but of greater intensity than, Alternative B1.

The visual impacts of this alternative are considered to be similar to the Proposed Action for most viewer groups. Landscape impacts would also be similar to the Proposed Action in terms of overall disturbance; however, Alternative B2 would retain larger blocks of natural landscapes intact. See Plate 6 and Table 2.4-3 for information on the location and quantity of changes anticipated. Table 4.13-2 summarizes the impacts to viewers.

Overall, Alternative B2 would temporarily disturb 4,510 acres, with long-term permanent changes to 2,775 acres. Compared to the Proposed Action, this alternative would cause greater impacts for production wells (831 wells) and roads (357 miles). With respect to VRM Class conformity, Alternative B2 would impact approximately 308 acres of federal lands designated as Class III and 1,797 acres designated as Class IV (Table 4.13-4). Based on present-day conditions, an estimated 1,829 acres potentially affected by Alternative B2 would meet VRM Class II or III standards (Table 4.13-4).

4.13.2.5 Alternative C1

Impacts of Alternative C1 to landscape character would be similar to, but less than, the Proposed Action. This alternative would restrict various areas from development and limit access during portions of the year for wildlife management purposes. Relevant information on the location and amount of disturbance associated with this alternative are shown on Table 2.5-1 and Plate 7.

Visual impacts from Alternative C1 are summarized on Table 4.13-2 and would be similar to the Proposed Action for most viewer groups. This alternative would retain the natural landscape character in selected areas used for dispersed recreational activities. Alternative C1 would impact approximately 259 acres of federal lands designated as VRM Class III and 1,890 acres designated Class IV (Table 4.13-3). Based on present-day conditions, an estimated 1,718 acres affected by this alternative would meet VRM Class II or III standards (Table 4.13-4).

4.13.2.6 Alternative C2

The impacts of Alternative C2 on landscape character are summarized on Table 2.5-3, with approximate locations of proposed facilities shown on Plate 8. Overall, this alternative would have similar impacts on viewers as Alternative A. Viewer impacts summarized on Table 4.13-2.

Alternative C2 would temporarily disturb 5,318 acres, with 3,306 acres permanently converted to industrial uses and facilities. Compared to the Proposed Action, this alternative would have similar impacts at 5 compressor sites and along 52 miles of pipelines. Greater impacts would occur from an additional injection well and evaporation pond, 1,013 production wells, and along 473 miles of roads. Alternative C2 would impact approximately 372 acres of federal lands designated VRM Class III and 2,606 acres designated Class IV (Table 4.13-3). Based on present-day conditions, approximately 2,751 acres impacted by Alternative C2 would meet VRM Class II or III standards (Table 4.13-4).

4.13.2.7 No Action Alternative

Under the No Action alternative, development would still occur on state lands and lands with state mineral rights. Plate 9 shows the distribution of facilities for this alternative, and Table 2.6-1 summarizes the overall amount of temporary and permanent disturbances anticipated. The No Action alternative would still result in the long-term

loss of 1,050 acres for 228 production wells, 5 compressor sites, 4 evaporation ponds and 4 injection wells. Approximately 47 miles of pipeline and 154 miles of roads would be built on state mineral lands.

Federal lands would remain predominantly natural in character, although additional access roads to state and private lands would create soil/vegetation contrasts, as well as truck traffic and fugitive dust. These visual changes would be moderate to strong in areas directly affected. The No Action alternative would still significantly affect views from rural residential areas and affect the visual quality along the County's designated trail system at Pinnacle Creek/Bench Road. Table 4.13-2 summarizes the visual impacts to viewers that could result from the No Action alternative. With respect to conformity with designated VRM Classes, the No Action alternative would impact only 69 acres of federal lands designated VRM Class III and 345 acres of lands designated as Class IV. Based on present-day conditions, the No Action alternative would still impact approximately 1,085 acres that are estimated to meet VRM Class II or III standards (Tables 4.13-3 and 4.13-4).

4.13.3 Impact Summary

A summary comparison of impacts of the Proposed Action and alternatives is presented in Table 2.7-2.

All the alternatives, including the No Action alternative, would substantially change the visual quality of portions of the Project Area and result in significant visual impacts to rural residences, to public lands used for recreation and to local travel routes. Natural pinyon-juniper and grassland/shrub landscapes would be changed to large-scale industrial developments. These types of changes are consistent with the BLM's VRM objectives for Class IV landscapes. Changes to Class III lands would most likely exceed the level of acceptable visual change, however, depending upon visibility conditions and the number and type of facilities planned. Private rural residential lands, estimated as Class II or Class III VRM due to viewer attitudes and numbers, would also be affected by reduced qualities in rural natural settings. Mitigation measures are needed throughout the Project Area to maintain the visual quality of views from Class II and III areas.

With respect to landscape character and quality impacts, the No Action alternative avoids impacts to the greatest extent. Alternatives B1 and C1 also minimize the amount of disturbance, compared to other alternatives being considered.

All of the alternatives, including the No Action alternative, would affect views from a variety of key observation points associated with residential areas, recreational lands, and travel routes. Table 4.13-2 shows the overall comparison of visual impacts for all alternatives.

4.13.4 Mitigation

Mitigation measures suggested below would further reduce the long-term visual impacts of the project facilities.

- All above ground facilities (e.g., wells, tanks, batteries, etc.) that would remain on site six months or longer, should be painted upon construction completion. Prior to construction each year, facility paint color(s) should be chosen in consultation with BLM to blend the facilities with the surrounding natural or rural landscape tones. Colors compatible with desert

salt (e.g. Carlsbad Canyon), pinyon-juniper and agricultural landscapes should be used. BLM should review and approve a color palette prior to issuance of APD.

- Wells should be sited to minimize skylining to the greatest extent possible. Setbacks along bench edges or within pinyon-juniper vegetation communities should be followed to reduce skylining of wells and drilling rigs. Prior to issuance of APD, a BLM recreation/ visual specialist should review the tentative locations of wells and provide recommendations of well placements if visual skylining impacts can be avoided.

- Ground disturbance activities, cut and fills, and removal of vegetation should be strictly confined to areas designated in the BLM-approved APDs. Minimizing disturbance would reduce contrasts between exposed soils and natural vegetation.

- Juniper and pinyon trees should be protected and used as screening for facilities to the greatest extent possible. Juniper and pinyon trees can potentially screen roads, activities and facilities not afforded by grassland and sagescrub vegetation.

Reclamation plans approved by the BLM, UDOGM and private landowners should be followed and monitored for at least two growing seasons.

4.13.5 Unavoidable Adverse Impacts

Unavoidable, adverse and significant impacts to landscape character or viewers would result from the proposed project or any of the alternatives, including the No Action alternative. Unavoidable adverse impacts are discussed under the No Action alternative. Mitigation measures described herein may minimize the degree of impacts that would occur, but would not substantially eliminate changes to the quality of existing settings and views described in this EIS.

4.14 NOISE

4.14.1 Introduction

The noise impact assessment estimates ambient noise levels resulting from construction activities, drilling, and operation of compressor stations and pumps. The assessment is performed by adding expected noise levels from these activities to existing background levels.

The Environmental Protection Agency (USEPA 1974) has identified an L_{dn} level of 55 dB as the maximum sound level that will not adversely impact public health and welfare. For the purposes of this assessment, a level of 55 dBA is used as the criteria for a significant adverse impact.

4.14.2 Direct and Indirect Impacts

4.14.2.1 Proposed Action

Impacts of Construction

Impacts from construction would be temporary and would result primarily from heavy equipment and vehicle traffic. The sound levels at a distance of fifty feet are presented in Table 4.14-1 for various types of construction equipment. Estimates of noise attenuation can be made by reducing noise levels by a factor of 6 dB for each doubling of distance. Using this formula, noise levels would be expected to fall below the 55 dB

level at a distance of approximately 800 to 3200 feet from the construction activities. However, since construction activities would occur only during daylight hours, and background levels in the Project Area are relatively low, the Ldn average values are expected to be below the significance levels. The actual noise levels experienced by a receptor will depend on the distance of the receptor from the construction activities, and residences located in close proximity to the construction activities could experience significant impacts.

Impacts from drilling activities would be expected to be similar to those from construction. Monitoring done for similar projects (WCC 1988) indicates that noise levels fall below 55 dB Ldn at approximately 500 feet from a wellpad. Thus, receptors located within 500 feet would be impacted.

Impacts of Operation

In addition to drilling and workover activities, the major noise sources during operation would be the compressor stations. Each compressor station would include gas and/or electric driven compressors housed in an enclosure. Based on information provided by Caterpillar Inc. (Johnson 1996), noise levels from the operation of such compressor drivers would be approximately 80 dB at a distance of 50 feet. However, the enclosure would reduce the noise level by approximately 30 dB. Thus, noise from compressor station operation would not be expected to exceed the impact significance criteria.

Noise impacts during field operations would also include vehicle traffic, wellhead operation, well workovers and drilling. Noise levels from these sources would be expected to be as high as 60 to 90 dB at a distance of 50 feet, similar to construction activities. Receptors located within 500 feet of these activities would experience significant impacts. Since some wells are proposed within 200 feet of residences, residents would experience significant noise impacts.

4.14.2.2 Alternative A

Alternative A would involve full development of project facilities using a well spacing of 80 acres. Impacts from construction would be similar to those from the Proposed Action. Similarly, Alternative A would also involve the same number of compressor stations during operation. However, the reduced well spacing would likely increase the probability of a receptor being located in close proximity (within approximately 500 feet) to construction or operation activities and experiencing significant impacts.

4.14.2.3 Alternative B1

Alternative B1 would involve partial development of project facilities using a well spacing of 160 acres. Impacts from construction would be similar to those from the Proposed Action. Similarly, Alternative B1 would also involve the same number of compressor stations during operation. Receptors located within approximately 500 feet of construction and operational activities would experience significant impacts.

4.14.2.4 Alternative B2

Alternative B2 would involve partial development of project facilities using a well spacing of 80 acres. Impacts from construction would be similar to those from the Proposed Action. Alternative B2 would involve the same number of compressor stations during operation. However, the number of engines would be less at some stations. However, the reduced well spacing

would likely increase the probability of a receptor being located in close proximity (within approximately 500 feet) to construction or operation activities and experiencing significant impacts.

4.14.2.5 Alternative C1

Alternative C1 would involve partial development of project facilities using a well spacing of 160 acres. Impacts from construction would be similar to those from the Proposed Action. Alternative C1 would involve the same number of compressor stations during operation. However, the number of engines would be less at some stations. Receptors located within approximately 500 feet of construction and operational activities would experience significant impacts.

4.14.2.6 Alternative C2

Alternative C2 would involve partial development of project facilities using a well spacing of 80 acres. Impacts from construction would be similar to those from the Proposed Action. Alternative C2 would involve the same number of compressor stations during operation. However, the number of engines would be less at some stations. However, the reduced well spacing would likely increase the probability of a receptor being located in close proximity (within approximately 500 feet) to construction or operation activities and experiencing significant impacts.

4.14.2.7 No Action

The No Action alternative would involve development on State and private lands. Impacts from construction would be similar to those from the proposed action. During operation, the number of compressor stations would decrease, thus making it less likely that residences would be located in close proximity to a station. However, receptors located within 500 feet of construction and operational activities would experience significant impacts.

4.14.3 Impact Summary

The proposed action and each of the alternatives would lead to short term increases in noise levels during construction. The use of enclosed compressor stations would mitigate some operational impacts. However, vehicle traffic, well workovers and drilling would produce locally elevated noise levels. The impacts experienced at a given receptor would depend on the distance between the receptor and the activity.

4.14.4 Mitigation

In cases where project facilities are located close to sensitive receptors, mitigation measures are recommended. The use of enclosures for the compressor station engines would reduce noise levels during operation to acceptable levels. Also, mufflers may reduce noise levels from pumps and other equipment.

4.14.5 Unavailable Adverse Impacts

Construction and operational activities would result in unavoidable adverse impacts to receptors located within approximately 500 feet of the activity.

4.15 SOCIOECONOMICS

4.15.1 Introduction

The following sections address potential project impacts on socioeconomic conditions in the Project Area portions of Carbon and Emery counties. The discussions will focus primarily

on the scoping issues identified in Section 1.6.1.

In terms of significance criteria, the proposed project would have significant impacts on socioeconomic conditions and quality of life in the Project Area if:

- Population growth were induced by the project that would exceed the capacity of the local housing market, community facilities and services, or otherwise cause significant growth-related social and economic changes;

- Local government fiscal conditions were impacted in such a way that revenues would not adequately provide public facilities and services at established levels;

- Project-related changes in existing ways of life that cause community discontent sufficient to raise conflict and organized response/opposition.

Methodology

For the Proposed Action and its alternatives, direct employment and earnings impacts are associated with employment and payment of wages by RGC and its contractors to workers directly involved with the project. For the Proposed Action, the direct employment values presented in this analysis were provided by RGC, which has projected its future staffing and contracting needs over the life of the project.

Woodward-Clyde estimated direct earnings, using current salary and wage rates for various RGC and contractor employees (provided by RGC) and applied them to the projected mix of employee types (managers, supervisors, tradesmen, etc.) on an annual basis over the life of the project. All earnings were calculated and are presented in current 1996 dollars. For transient construction workers, who reside in the Project Area on a seasonal basis, the estimated expenditure of earnings in the local economy was assumed to be the daily per diem rate these workers are paid for lodging and meals. This assumption was based on input from the Governor's Office of Planning and Budget, which, in various studies, has found expenditure of earnings by transient workers is very limited beyond actual living expenses. For the project alternatives, employment and earnings values were scaled, based on the number of wells that would be developed, and miles of roads that would be constructed. Since RGC has been operating in the Project Area since 1993, and is currently employing many workers and paying wages, royalties and taxes, the analysis of economic and fiscal impacts of the Proposed Action and its alternatives focuses on what the net increase or decrease of employment or earnings would be in the Project Area, relative to current conditions.

Indirect impacts are associated with project-related purchases of assorted equipment and supplies, such as pipe, well casing, and valves from vendors. Some of these purchases would be from businesses within Carbon, and possibly Emery Counties, while other purchases would be from businesses outside of the Project Area, in cities such as Vernal. The discussion of the indirect impacts of this project will focus primarily on purchasing activity from businesses within the Project Area. This local area purchasing activity would generate indirect economic impacts on the Project Area through increased hiring and associated payment of earnings to people working at these businesses.

Induced economic impacts are associated with the expenditure of project-related earnings within the communities of the Project Area on housing, gasoline, food, and numerous other goods and services. In general, by increasing sales of these goods and services, the proposed project would induce additional hiring of workers and associated payment of earnings by the businesses providing the goods and services.

For calculation of both indirect and induced economic impacts of the project, an input-output (I/O) model of the joint Carbon and Emery county economy was run using both data provided by RGC on purchasing activity, and earnings figures calculated by Woodward-Clyde, based on RGC's projected employment for the project. The I/O model was constructed by the Utah Governor's Office of Planning and Budget specifically for Carbon and Emery Counties. The model was run with the assistance of the Utah Department of Natural Resources, Office of Energy and Resource Planning. In brief, the model calculates estimated employment and earnings that would be generated through purchasing activity and expenditure of earnings, as described above, by applying economic multiplier effects to purchases and expenditures. It is important to note that while the model was constructed and run by state government agencies, the employment and earnings data used to compute input values for the model were provided by RGC and Woodward-Clyde. Thus, the indirect and induced economic impacts presented in the analysis are not the official projections of the State of Utah.

Since the emphasis of the analysis is the net change to the Project Area relative to current conditions, the indirect and induced economic impacts predicted by the model for the future were compared with those calculated by the model for 1996, using current earnings and purchasing values as inputs.

4.15.2 Direct and Indirect Impacts

4.15.2.1 Proposed Action

Employment and Earnings

The Proposed Action would directly create numerous jobs in the Project Area over the life of the project, which is estimated to be roughly 30 years. Table 4.15-1 provides a detailed breakdown of job types over the life of the project for all alternatives. The table provides both total direct project employment and the net increase/decrease in employment for local area residents, relative to current employment conditions. Table 4.15-2 summarizes the change in total direct employment of local area residents for all alternatives. In general, project-related direct employment would jump from current levels of about 164 workers to 171 workers in the 1997 construction season and increase gradually until about the year 2006, when employment would reach its peak at about 214 positions. Thus, at project peak, the Proposed Action would result in a net increase of about 50 jobs (a 2.6% increase in the current mining/oil and gas employment sector), relative to current conditions. The vast majority of these jobs would be occupied by local area residents. After completion of the construction phase of the project, employment would drop off sharply in the year 2007 to about 98 positions as the number of construction workers would be sharply reduced. This completion of construction would result in the unemployment of about 33 local construction workers (a 7.4% loss of current construction employment) that would have to find alternative sources of employment in the local area.

Project employment in the post construction phase would be primarily related to CBM field operation and maintenance (RGC employees), as well as gradual reclamation of the field and associated roads as gas wells go out of production (estimated to be 30 local contractors). During that period, from roughly 2006 to 2026, employment would gradually diminish from about 98 positions to 50 in the year 2026. This decline in employment would comprise a net loss of up to 31 jobs, relative to current conditions. At the very end of the project, when employment would drop to zero, around 2027, the Project Area would experience a net loss of about 81 positions, compared with current conditions. This loss of 81 jobs would comprise a 3.5% loss in employment in the mining/oil and gas and construction sectors, but a less than one percent decrease in total Project Area employment. These unemployed workers would have to find work on other CBM or mining projects, or take lower paying jobs in the service and trade industries. Figure 4.15-1 provides an illustration of projected net increases/decreases in employment of local area residents by alternative over the life of the project.

In terms of employment types and recruiting by the project applicant during the construction phase, about 63 workers would be seasonally employed by a local area construction contractor that would be hired by RGC to construct and maintain roads and well pads, construct utility trenches, and install underground gas pipelines, water pipelines, and underground electric lines. This level of contractor employment would be similar to current conditions. Thus, no net increase in local contractor employment is expected to occur during the construction phase of the project (Table 4.15-1). Examples of local contractor jobs would include gravel and water truck drivers, heavy equipment operators, and pipeline workers. According to the current construction contractor, workers required to staff the project have been and would be hired almost entirely from the local communities in the Project Area (Jensen 1995).

Similarly, RGC would directly hire production hands to monitor and maintain CBM wells, as well as staff the company office in Price. These positions would be year round, rather than seasonal, construction jobs. This hiring by RGC would result in a net increase of up to 50 positions, relative to current conditions. Many of these workers would be hired from the local area, particularly if they possessed necessary skills, such as pump and pipeline maintenance, compressor and electric motor maintenance, and some computer skills needed for production monitoring. It is important to note that many of the positions could be filled by former power plant and coal mine workers still living in the local area who possess the required skills. Many of these workers are presently employed in service and trade sector jobs earning wages considerably lower than previously earned as miners or power plant construction workers. Local workers who have relevant skills and experience needed to staff the project would likely leave the typically lower paying trade and service positions for the higher wage job opportunities the project would create ($7 - $15/hour for tradesmen, $17 - $22/hour for supervisors). The employment vacancies in the trade and service industries would likely be filled by unemployed residents of the local area, including students at the CEU, who lack the skills necessary to take advantage of the higher wage jobs that would be created by the project (Utah Department of Employment Security, 1996) (Utah Governor's Office of

Planning and Budget, 1996). It is also possible that certain RGC positions would have to be filled by non-local workers where specialized expertise is required.

The remaining portion of the project workforce would consist of non-local transient construction workers with specialized expertise needed to drill and complete the CBM wells. These workers would reside in the Project Area for about six months each year during the May to November construction season. It is estimated that about 83 transient construction workers would reside in the Project Area during the construction season each year. This level of transient contractor employment would be similar to current conditions. Thus, no net increase in transient contractor employment is anticipated during the life of the project. According to RGC, the vast majority of these workers live in motels while they are working in the Project Area and do not bring their families with them to the Project Area. After completion of the construction phase of the project, it is likely that the vast majority of transient contractor employees would leave the Project Area in pursuit of other employment opportunities.

The proposed project would also generate substantial earnings, a large portion of which would be spent in the local economy for housing, food, and goods and services. Based on projections provided by RGC, it is estimated that project payroll would amount to $2.67 million in the first year of the project (a 6.7% increase in Project earnings from 1996) and increase until the year 2005 to $3.7 million (in current dollars) as the project reaches its employment peak (a 48% increase in project earnings from 1996). After that, during the production and reclamation phase, earnings would gradually decline from $2.56 to $1.41 million annually in 1996 dollars. At the very end of the Project, when earnings would drop to zero, the Project Area would experience a net loss of $2.5 million in local earnings relative to 1996, which would represent a 3.5 percent loss of total earnings in the Project Area. To the extent total local area earnings increase over the next 30 years, the loss of project-related earnings would actually represent less than 3.5 percent.

As described in the Methodology section previously, economic benefits would occur as a result of RGC purchases of equipment and supplies from local area vendors (indirect economic impacts) and expenditure of project-related earnings on housing, food, and goods and services provided by Project Area businesses (induced economic impacts). Estimates of these indirect and induced economic benefits that would be generated by the Proposed Action were calculated using an input-output economic model, created by the Governor's Office of Planning and Budget, for Carbon and Emery counties, using purchasing data provided by RGC and earnings values estimated by Woodward-Clyde.

Based on the direct project employment and associated earnings estimates, the Proposed Action would create up to 13 additional new jobs in local area communities during the construction phase of the project. These jobs would represent a net increase above what the project is estimated to have indirectly created in 1996. These would primarily consist of service and trade sector jobs, with a few jobs created in finance, insurance, and real estate, as well as transportation and public utilities. Since the vast majority of service and retail trade activity occurs in the Price area, it is assumed that most of these new jobs would also be created in Price, or adjacent

communities in Carbon County. These new jobs indirectly created and induced by the Proposed Action would comprise both expansion of existing businesses and creation of new businesses. Conversely, after completion of project construction, the reduction in direct employment and earnings would indirectly result in a reduction of service and trade sector jobs. Compared with current conditions, the Project Area would experience a net loss of about 54 service and trade sector jobs over the 20 year production and reclamation phase of the project.

Similarly, the indirect/induced creation of jobs would generate additional earnings in the local economy that would also be spent in the local area. Based on project-related earnings and purchasing activity, the economic model has estimated the Proposed Action would indirectly generate up to $226,000 in additional earnings per year during the construction phase of the project above and beyond what the RGC project is currently generating. These indirect earnings would be generated primarily due to the increased service and trade sector employment, but also due to increased transportation and utility employment, construction employment, and finance, insurance and real estate employment. After completion of project construction, the reduction in direct earnings would indirectly result in a reduction of service, trade, and other job sector earnings. Compared with current conditions, the Project Area would experience a net loss of up to $729,000 in indirect earnings per year over the 20 year production and reclamation phase of the project.

Population, Housing, and Community Facilities and Services

Since many of the estimated 50 RGC new year-round workers would be recruited from communities within the Project Area (gradually hired from 1997 through 2006) and the use of local construction workers would remain at current levels during the construction phase of the project, it is likely that only a modest increase in population would occur.

Several new housing developments are being considered in the Project Area that could increase the supply of available housing. Assuming these housing developments are approved, the addition of a modest number of new residents associated with the Proposed Action would not adversely impact the local housing market.

As described in Section 3.15, recent population growth has resulted in increased public school enrollment in Carbon County to the point that many schools are nearing capacity. To the extent project workers are recruited from outside the local area and bring families with school-age children, the Proposed Action would aggravate this shortage of school capacity. The Proposed Action would, however, mitigate the impact of increased demand for school capacity indirectly through payment of about $7.0 million in ad valorem taxes to the Carbon County School District. These tax dollars could be used by the District toward funding school expansions and/or hiring of additional teachers and staff.

The proposed use of non-local construction workers for specialized construction activities would include about the same number of workers that have been used in recent years (83 workers). Thus, little or no additional

demand for temporary housing would occur in the future. The vast majority of transient construction workers brought in from outside of the Project Area would not bring their families with them and would generally utilize motels, recreational vehicles, and mobile homes for housing. As a result, little or no increase in demand on public schools or other community facilities and services from transient construction workers is foreseen.

With respect to law enforcement services, the Carbon County Sheriff's Office has stated it would not patrol the CBM field or provide other routine security services. The sheriff's office would, however, respond to calls on an as needed basis if vandalism or other criminal activity were reported in the CBM field. Thus, no need for an increase in staffing at the Sheriff's Office is foreseen as a result of the Proposed Action (Robertson 1996). In general, RGC employees who work on night shift would patrol the CBM field and provide their own security services. The sheriff's office would only be called in the event of a crime. Thus, the Proposed Action is not expected to increase costs of law enforcement in the Project Area.

Costs and Benefits of the Proposed Project on Local Government Fiscal Conditions

The Proposed Action would result in some costs for the counties in the Project Area, but would also generate benefits for those entities. On balance, total revenues are projected to exceed increased costs by a wide margin.

In terms of actual financial costs, the most important potential project-related impact concerns the use of county roads. Within Carbon County, the government agency that has responsibility for building, improving, and maintaining these roads is the Carbon County Roads Special Service District. In Emery County, this responsibility rests with the Emery County Special Service District #1. Revenues used by these districts is generated through federal mineral lease royalties, state payments in lieu of taxes (PILT), and interest earned on funds not expended.

Cost of County Road Maintenance

For the proposed project, initial access to considerable portions of the CBM development area from state and federal highways would require the use of county roads and could increase maintenance costs borne by the special districts. However, it is important to note that the vast majority of project-related roads in the Project Area would be constructed, maintained and plowed as needed by RGC at its own expense. In terms of the balance of costs versus benefits from the proposed project, discussions with the Carbon County Roads Special Service District have revealed that to date, RGC has performed many of the maintenance activities on the county roads it has used in recent years. In addition, the district and RGC have projected future royalty payments that the district would receive as a result of the proposed project. The estimated royalty payments Carbon County would receive for roads could be as high as $1 million annually if production estimates are accurate. Based on those projections, the Carbon County Roads Special Service District has concluded that royalty payments from the proposed project would more than compensate for any increased maintenance costs the County may have to bear in the future (Semken 1995). Similar beneficial fiscal impacts are anticipated for the Emery County Special Service District #1.

The Permanent Community Impact Fund

As described in Section 3.15.2, another important source of revenue that would be contributed by the proposed project that is also related to mineral royalty payments is the Permanent Community Impact Fund (PCIF), which is administered by the State of Utah. In general, the PCIF was established to provide rural communities in Utah that generate mineral lease royalties a means of funding major infrastructure projects that benefit them over the long-term. Rather than making the royalties available to communities for general fund expenditure, the PCIF program was created specifically to fund infrastructure projects (Clarke 1996). Cities within the Project Area, such as Price, Helper, Wellington, Huntington, and Castle Dale can apply for grants and loans to fund a variety of infrastructure projects, such as roads, sewer projects, educational institutions, and recreational facilities.

RGC has estimated that royalty payments from the proposed project would contribute several million dollars to the PCIF over the life of the project, which would result in beneficial impacts for cities that would receive PCIF funds within the Project Area, as well as in other parts of Utah.

The PCIF is a significant source of funds for infrastructure development in the Project Area. From 1991 to 1995, Carbon County cities within the Project Area received approximately $2.4 million in grants and $13.2 million in loans from the PCIF for 23 infrastructure projects. Similarly, Emery County cities within the Project Area received approximately $6.0 million in grants and $1.0 million in loans for 19 infrastructure projects. In terms of royalty payments into the PCIF, from 1991 to 1995, Carbon County mining and oil and gas operations contributed about $6.9 million, while Emery County operations contributed about $19.8 million, which was the highest in the state. Although counties are generally supposed to receive PCIF funds that correspond with their contributions, some counties pay more than they receive and others receive more than they contribute. From 1991 to 1995, Emery County contributed more than twice what it received, whereas Carbon County received more than twice what it contributed (Utah Department of Community and Economic Development 1995).

By contributing millions of dollars to the PCIF via federal royalty payments, the Proposed Action would indirectly support future infrastructure projects in Carbon and Emery counties through PCIF grants and loans to the local communities, thereby providing long-term benefits that may outlive the project itself.

State Mineral Royalties and Taxes

Mineral lease payments are also collected by the State of Utah for wells producing on state lands. In 1995, state royalty payments for RGC wells amounted to $1.74 million. Over the life of the proposed project, these payments would increase each year until the year 2005, when the project would reach full production. This revenue would be paid into both the State School Trust and the Utah General Fund; the amounts allocated would be based on the types of state lands leased. Severance and Conservation taxes on gas produced by the proposed project would also contribute revenue to the State government. It is estimated that these tax payments associated with proposed wells would be $300,000 in 1996 and would increase during the construction phase of the project due to

increases in production. Over time, as production would decline, this source of revenue would also decline.

Local Ad Valorem Tax Revenue

With respect to the cities and counties of the Project Area, another important source of revenue that would be generated by the proposed project would be ad valorem/ property tax that would be levied on improvements constructed by RGC. In 1996, wells and other improvements are anticipated to generate about $298,000 in ad valorem tax revenue in Carbon County. This ad valorem tax revenue would be used by the county to fund a variety of services and facilities. The Carbon County School District would receive the largest portion of county ad valorem tax revenue. Over time, as the number of wells and improvements were increased, ad valorem taxes would increase correspondingly. When the project construction phase would reach Emery County, ad valorem tax revenue would be collected by that county for schools and other facilities and services. Based on gas reserve predictions, RGC has estimated the future and valorem taxes the project would generate. Very preliminary estimates of ad valorem taxes that would be paid during the construction phase of the project (through about 2005) amount to approximately $11.62 million that would be paid to Carbon County, and $1.5 million that would be paid to Emery County. In Carbon County, estimated payment of ad valorem taxes by RGC would result in an increase of up to 14% in this source of revenue at its peak, relative to 1994. Ad valorem tax payments would continue in the years following, but would decline annually as wells go out of production and the value of equipment depreciates. This eventual decline in revenue in Carbon and Emery Counties could result in reduced funding for community facilities and services, unless other projects and economic growth in general replace declining RGC tax revenue. Figure 4.15-2 provides preliminary projections of ad valorem tax revenue for both counties.

Sales and Use Tax Revenue

In terms of indirect fiscal impacts, purchasing activity by RGC would generate sales and use tax revenue for the cities and counties of the Project Area and the State of Utah. Although precise purchasing amounts are not available, it is estimated that purchasing activity in the local area would amount to about $3.8 million annually. Based on a sales tax rate of 5.78% (4.78% state, 1% local), the Proposed Action would generate about $182,000 in state sales tax revenue and $38,000 in local sales tax revenue per year in 1996 dollars during the construction phase of the project. Local governments in turn would use this tax revenue for providing services and operating community facilities, thereby benefiting local area residents.

In summary, from a fiscal cost versus benefits standpoint, the Proposed Action would contribute millions of dollars to various state and local government entities. Despite costs that would be borne by the counties for road maintenance, the project would result in a large net benefit for local government fiscal conditions. Over time, as production eventually would decline and end, royalties and tax revenues generated would also decline and end.

Estimating the Economic and Quality of Life Costs Associated With the Degradation of Outdoor Recreational Opportunities

One issue raised regarding the overall benefits and costs of the proposed project is the potential impact to quality of life for Project

Area residents associated with lost or degraded recreational opportunities. Given that the proposed project would construct numerous facilities (wells, roads, etc.) in relatively undisturbed areas, there is concern that outdoor recreational experiences enjoyed by local area residents, such as hunting, off road vehicle use, mountain biking, and wildlife observation, would be substantially degraded.

Hunting. Elk and deer hunting is one of the most important recreational activities in the Project Area. It is enjoyed by numerous local area residents, visitors from other parts of Utah, as well as visitors from other states. Hunters from outside of the Project Area generate economic benefits in Price and other local communities due to hunter expenditures on fuel, ammunition and other hunting equipment, motel rooms, meals, and other goods and services. Based on UDWR data, the average hunter expenditure per elk harvested is $1,075 (assuming $62 average expenses per day, 2.6 days/permit, and a 15 percent hunter success rate). Similarly, for mule deer, the average hunter expenditure per deer harvested is $710 (Bates 1996b).

As described previously in Section 4.7, the Proposed Action would impact elk and deer habitat and thereby reduce game populations. With reduced game populations, the UDWR would issue fewer elk and deer hunting tags. These project-related impacts on game populations would result in a reduction of about $154,000 in elk hunting-related income for the local economy annually, and a $179,000 reduction in deer hunting income annually ($333,000 combined). It is important to note these values assume game populations are at target/healthy management levels. In recent years, game populations have been far lower than target levels due to adverse conditions (i.e., drought and severe winters). Thus, the reduction in hunting-related economic activity with the Proposed Action could actually be less than described above.

In addition to elk and deer, other important game species that are hunted or pursued on a smaller scale include the pronghorn and mountain lion, although the number of hunters that pursue them is considerably smaller than for elk and deer. In 1995, approximately 72 hunter days were recorded in the Project Area for pronghorn and 99 hunter days were recorded for mountain lion. In addition, 175 pursuit days were also recorded for mountain lion pursuits (where lions are tracked, treed and released, not killed) (Mills 1996). Although the number of hunters that visit the Project Area for pronghorn and mountain lion is smaller than for elk and deer, the hunting of these species also contributes to the local economy, as visitors from outside of the Project Area make expenditures on accommodations, food, fuel, and various supplies in the Project Area. With respect to mountain lion hunts/pursuits, many hunters utilize local guide services and expend considerable amounts of money during their hunts/pursuits. This money is circulated in the local economy, generating economic benefits for the Project Area. As described for deer and elk, potential project impacts to pronghorn habitat and/or mountain lion habitat and prey populations could reduce the number of hunter permits issued and thereby reduce the economic contribution of hunting these species bring to the local economy. The economic impact of reduced pronghorn and mountain lion hunting would be considerably smaller than described for elk and deer, however.

Finally, numerous other types of wildlife are also hunted in the Project Area, although

hunting of these species is generally carried out by local area residents. These species include mourning dove, quail, pheasant, waterfowl, coyote, cottontail rabbit, jack-rabbit, and prairie dogs. Potential project impacts on the habitats of these wildlife species could reduce their populations, to some extent, and therefore hunter success rates. This would represent a negative impact both from a recreational standpoint, but also from an economic standpoint if local area hunting activity were to decrease and purchases of ammunition and other hunting supplies were to decline. This economic impact would be relatively small compared with elk and deer hunting reductions, however.

Informal Outdoor Recreation. Aside from hunting, many local residents also enjoy informal recreation activities in the Project Area, such as off road vehicle use, mountain biking, and wildlife viewing. In general, the estimation of costs to the local population due to degradation of informal recreational opportunities is an inexact science, and can be the subject of considerable debate. Although, in many cases, a market does not exist specifically for scenic beauty or pristine recreational opportunities, there are real world examples where market valuation is influenced by such characteristics. Consider, as an example, the increased market value for a home with a scenic view, or that is in close proximity to ski slopes. The market value for a home with one of these characteristics will be higher than for the same home without either of them. This increased value is directly related to the willingness of buyers in the market to pay for scenic views or easy access to ski slopes.

Various studies have been carried out in different parts of the country in an attempt to quantify the loss of value to scenic views or recreational resources due to construction of industrial facilities or other human disturbance. These studies have recognized that wilderness, wildlife, air quality, water quality, and recreationally important lands have considerable value to society, even if a market value can not be readily assigned. These studies have shown that many citizens place a value on wilderness and other recreational resources, whether they intend to use them or not. Conceptually, these studies have found that some individuals value having recreational opportunities available, so they have the option of using the resource when they choose to (option value). Other citizens may choose to never use the resource, but value the fact that it exists (existence value), similarly, many respondents indicated that although they would not personally use the resource, they wanted their children and other descendants to have the opportunity to visit the resource in the future (bequest value). Examples of these studies include an assessment of the effects of construction of additional coal-fired power plants near Lake Powell. Another addressed the effects of power plant emissions on visibility in the Grand Canyon and the loss of recreational value. These studies involved extensive survey research of recreational users, combined with detailed information on the type and number of recreational visits.

For the proposed project, calculating a value associated with the reduced recreational appeal of the Project Area due to CBM development would require a study specific to the local area. Since no survey research has been conducted of recreational users in the local area, and specific recreational use numbers (e.g., numbers of mountain bikers, birdwatchers, etc.) are not available at this time, a specific dollar value associated with

potentially lost or degraded recreational experiences can not be derived at this time. Although a specific dollar value associated with the informal recreational opportunities of the Project Area has not been calculated for this analysis, it is important to acknowledge that non-market sources of economic value exist and that they would be negatively impacted by development of the Proposed Action. Local area residents who recreate in the area proposed for CBM development, or at least value the area in its undeveloped state, would experience this type of loss.

Potential Adverse Impacts of an Economic Boom-Bust Cycle

During the first ten years of the Proposed Action, employment, earnings, and royalties and tax revenues would all increase, relative to current conditions, resulting in beneficial social and economic impacts to the Project Area. However, after construction is completed and gas production in the CBM field declines, project-related employment, earnings, and royalties and tax revenues would decline.

The analysis of the potential for the Proposed Action to cause an economic boom-bust cycle in Carbon and Emery Counties must first place the project in the context of the overall Project Area economy. To accomplish this, estimated project employment figures were compared with 1996 employment figures provided by the Utah Department of Employment Security for the mining sector (which includes oil and gas employment), construction sector, and total non-farm employment for the Project Area.

As described previously, the project would result in a net increase of about 50 local area jobs at project peak, a layoff of about 33 local construction workers in about 2007, and then a loss of about 50 local area jobs at project completion in 2027 (Table 4.15-1). These employment impacts equate to a 2.6% increase in mining/oil and gas employment at project peak, then a 7.4% loss of local construction employment in 2007, and eventually a 3.5% loss in mining/oil and gas sector employment at project completion. It is important to note that project-related gains and losses in employment are compared with 1996 employment values, which may be considerably different than actual employment values in the future. For example, assuming the construction industry will grow over the next ten years due to other projects in the local area, the loss of 33 jobs may actually represent a smaller than 7.4% loss in construction sector employment. Conversely, if the construction industry declines in size over the next 30 years, the eventual loss of jobs may be larger than 7.4% of employment in that sector.

Similarly, the construction phase of the project would cause an increase in earnings in the Project Area, relative to current conditions. The completion of the construction phase and eventual depletion of gas in the CBM field would result in declining earnings over time. At project completion, local earnings would drop to zero, resulting in net loss of about $2.5 million in earnings annually, relative to 1996. This loss of $2.5 million would represent a 3.5% loss of total earnings for Carbon and Emery Counties as a whole, again assuming total earnings in 2027 would be comparable to 1996. It is assumed total Project Area earnings will be considerably larger in 2027, and thus, the loss of earnings from project completion would be smaller than 3.5%.

Thus, although the Proposed Action would result in an increase and then a decrease in

Project Area employment and earnings, compared to current conditions, the relative size of these increases and decreases are small in the context of the overall economy. In addition, with the growth of the service and trade sectors in Carbon County, as well as an increase in tourism in recent years, the economy of the Project Area is more diversified than it was in the 1970s and early 1980s. Accordingly, changes in the mining and utility industries generally have less impact today than they did 15 years ago. In conclusion, although construction and mineral/gas sector employment and earnings would decline in the later years of the project, it is unlikely that the economy of Carbon and Emery Counties would "bust" as it did in the early 1980s.

The eventual decline in employment and earnings would result in hardship on families no longer employed by the project and would result in reduced tax revenues for local governments. However, the total contribution of the project to the local economy and local government fiscal conditions would have long-term positive impacts on the Project Area, particularly with respect to infrastructure and community facility improvements that would be funded by the project indirectly through tax and royalty payments and PCIF grants from the state.

Although many hardships were experienced in Carbon and Emery counties in the 1980s due to the "energy bust" and general economic downturn, many important community facilities and infrastructure that remain in use today were constructed with revenues generated by the coal and electrical utility industries during their "boom" years. Thus, although the proposed project would not provide permanent employment and revenue benefits past 30 years, it would contribute substantially to the construction of infrastructure and community facilities within the Project Area that may last many years after the project itself has ended.

Applicant Support of the Local Community

Recently, RGC has made financial contributions to the Helper Arts Festival, the air show held at the Carbon County Airport, an Emery County drug awareness program, and the Rocky Mountain Elk Foundation. In addition, RGC has donated equipment for lighting the local skating rink, and has donated various equipment for use at the Carbon County Fairgrounds. Finally, RGC recently sponsored a tree and shrub planting project carried out by local area Boy Scouts.

Although RGC does not have specific plans for sponsoring community events or organizations in the future, company officials have stated an interest in continued sponsorship and/or participation in community events in the future.

Quality of Life Issues

The assessment of impacts to quality of life is a subjective and controversial subject. Opinions, attitudes, and lifestyles vary considerably in the Project Area as do perceptions of potential impacts of the proposed project on quality of life in Carbon and Emery Counties.

For those in the Project Area who strongly value outdoor recreation experiences, such as mountain biking and wildlife viewing, the proposed project would likely degrade the quality of life for those individuals. Similarly, the reduced availability of outdoor recreation opportunities in the local area may reduce its appeal to potential new residents and businesses. Section 4.11 describes potential

impacts to recreation resources in more detail. Similarly, individuals that would find the sight of CBM facilities and wells in open space areas unattractive may also feel the project would have adverse impacts on their quality of life. RGC would implement mitigation measures that would reduce visual impacts, such as painting CBM facilities colors that blend well with the surroundings. In addition, the maintenance of clean working areas would minimize unsightly debris. These measures would help to reduce potential impacts to the attractiveness of the Project Area and associated quality of life.

The Project Area has a long history of mining and natural resources extraction and production. Many residents in the Project Area currently derive their livelihoods from coal mining and power plant operations (12 percent in Carbon County, 46 percent in Emery County). In general, the fact that employment in these industries provides higher wages and is the economic base of the region is well understood in the communities of the Project Area. Unlike other areas where a new mine or natural gas development would cause significant changes in the composition and character of local communities, the proposed project would be compatible with other industries that have been established in the Project Area for many decades. For individuals that would be employed directly or indirectly, the project may have beneficial impacts on quality of life. In general, wages that would be paid to project workers would be higher than many of the wages paid to service and trade sector workers in the Project Area. In addition, to the extent the proposed project provides additional tax revenue and royalty income to various local government entities and increases the funding of important community facilities and services, the project could have beneficial impacts on the quality of life in the Project Area.

4.15.2.2 Alternative A

Employment and Earnings

Alternative A would create more construction and RGC company jobs in the Project Area, compared with the Proposed Action. During the construction phase, local contractor employment would increase by about 50 positions, and transient contractor positions would increase by about 66 positions, compared with current conditions, due to the increase in wells that would be drilled and completed annually. In addition, RGC would hire an additional eight or nine new employees annually to maintain the growing CBM field. At project peak, employment of local area residents would increase by about 155 additional workers, relative to current conditions (Table 4.15-1). At the end of the construction phase, total project employment would decline by 209 positions (149 transient contractor jobs and 59 local contractor jobs lost). Over the following 20 years, as wells go out of production, RGC employment would gradually decline as well. At project completion, when direct employment would drop to zero, the Project Area would experience a net loss of 81 jobs, compared with 1996 (Figure 4.15-1).

Direct project earnings for local area employees, along with transient contractor per diems that would be spent in the local economy would amount to approximately \$4.8 million in 1997, and would increase to about \$6.7 million at project peak in 2006, compared with about \$2.5 million in 1996. After 2006, earnings would decline due to the abrupt loss of construction jobs and gradual reduction of employment of RGC CBM field workers.

The expenditure of direct earnings by project workers and purchases of equipment and supplies by RGC generate additional employment and earnings in the local economy. Based on direct employment and earnings, as well as project purchasing activity, Alternative A would create up to 23 additional new jobs in local area communities during the construction phase of the project, beyond what the project created in 1996. As described for the Proposed Action, these jobs would be primarily in the trade and service sectors, and would include both expansion of existing businesses and creation of new businesses. After completion of project construction, the reduction in direct employment and earnings would indirectly result in a reduction of service and trade sector jobs. Compared with current conditions, the Project Area would experience a net loss of about 54 service and trade sector jobs over the 20 year production phase and completion of the project.

Similarly, the indirect/induced creation of jobs would generate additional earnings in the local economy that would also be spent in the local area. Based on project-related earnings and purchasing activity, Alternative A would indirectly generate up to $407,000 in additional earnings per year during the construction phase of the project above and beyond what the RGC project is currently generating. These indirect earnings would be generated primarily due to the increased service and trade sector employment. After completion of project construction, the reduction in direct earnings would indirectly result in a reduction of service, trade, and other job sector earnings. Compared with current conditions, the Project Area would experience a net loss of up to $1.3 million in indirect earnings per year over the 20 year production phase of the project.

Population, Housing, and Community Facilities and Services

Since the majority of new year-round workers would be recruited from communities within the Project Area, it is likely that only a modest increase in population would occur. The proposed use of non-local construction workers for specialized construction activities would include approximately 225 workers, which would represent an 80 percent increase above historic levels. This potential increase of 100 non-local workers coming to the Project Area in need of housing would not put a strain on the currently tight rental housing market in the Project Area because temporary housing units, such as motel rooms and mobile homes would generally be used. These types of units are in greater supply than is the case for more permanent types of housing. Since non-local workers would generally not bring their families with them, little or no increase in demand on public schools or other community facilities and services would occur due to these non-local workers.

Costs and Benefits of the Proposed Project and Local Government Fiscal Conditions

Alternative A would result in some costs for the counties in the Project Area, but would also generate benefits for those entities. On balance, total increased revenues would vastly exceed increased costs to the state and local governments. These costs and benefits would both be greater in magnitude than for the Proposed Action due to the increase in the number of wells and associated truck traffic and road use, as well as increased royalty and tax revenues that would be generated.

In general, it is likely that Alternative A would contribute tens of millions of dollars to various state and local government entities over its 30+ year life. Despite costs that would

be borne by the counties for road maintenance, the project would result in an even larger net benefit for local government fiscal conditions.

Estimating the Economic and Quality of Life Costs Associated With the Degradation of Outdoor Recreational Opportunities

Impacts to hunting and other outdoor recreation opportunities would be similar in nature to those described for the Proposed Action, but would be greater in magnitude, due to greater disturbance of game habitat and areas used for outdoor recreation. With respect to hunting, using the same assumptions described for the Proposed Action, project-related impacts on game populations would result in a reduction of about $154,000 in elk hunting-related income for the local economy annually, and a $236,000 reduction in deer hunting income annually (about $390,000 combined). These values are again based on healthy elk and deer populations. If game populations are lower than target management levels in the future, the reduction in hunting-related economic activity with Alternative A would actually be less than described above. The more extensive development that would occur under this alternative could also reduce hunting opportunities for other species, such as mountain lion, pronghorn, quail, and the other species described for the Proposed Action.

With respect to outdoor recreation, impacts associated with reduced or degraded recreational opportunities to local area residents would be somewhat greater than described for the Proposed Action, due to the increased number and density of CBM wells, and related visual and truck-related disturbance.

Potential Adverse Impacts of an Economic Boom-Bust Cycle

The issues associated with a potential boom-bust cycle for Alternative A would be the same as those described for the Proposed Action, although the increase in the number of jobs for local residents at peak of the boom period, and the number of jobs eventually lost would be greater (Table 4.15-1) (Figure 4.15-1).

As described previously, Alternative A would result in a net increase of about 155 local area jobs at project peak, a layoff of about 59 local construction workers in about 2007, and then a net loss of about 81 local area jobs at project completion in 2027 (Table 4.15-1). These employment impacts equate to a 16.8% increase in mining/oil and gas employment at project peak, then a 13.3% loss of local construction employment in 2007, and eventually a 3.5% loss in mining/oil and gas sector employment at project completion. Again, the project-related gains and losses in employment presented have been compared with 1996 employment values, which may be considerably different than actual employment values in the future. Actual percentages of jobs gained and lost in their respective industries and compared to the economy as a whole would ultimately depend on their actual size in the future.

Although this alternative would result in an increase and then a decrease in Project Area employment even greater than under the Proposed Action, given the diversification of the local area economy in recent years, it is unlikely that the economy of Carbon and Emery Counties as a whole would "bust" as it did in the early 1980s as a result of the project, despite the sudden jump in

unemployment in the construction industry anticipated.

Quality of Life Issues

The issues associated with a quality of life for Alternative A would be the same as those described under the Proposed Action, although with considerably more intensive development, visual impacts and related impacts to quality of life for some Project Area residents would be even greater.

4.15.2.3 Alternative B1

Employment and Earnings

Since the number of CBM wells and associated roads would be reduced under this alternative, compared with the Proposed Action, Alternative B1 would create fewer jobs in the Project Area over the life of the project. Furthermore, direct project employment of construction workers would actually be reduced, relative to current conditions over the entire construction phase of the project. During the construction phase, local contractor employment could actually drop by about 19 positions, and transient contractor employment would drop by about 25 positions, compared with current conditions, due to the reduction in wells that would be drilled and completed annually. However, during that period, RGC would hire an additional three or four new employees annually to maintain the growing CBM field. At project peak, RGC would employ about 11 additional local area workers beyond those currently employed by the project (Table 4.15-1). At the end of the construction phase, total project employment would decline by 81 positions (58 transient contractor jobs and 23 local contractor jobs lost). Over the following 20 years, as wells go out of production, RGC employment would gradually decline as well (Figure 4.15-1).

Direct project earnings for local area employees, along with transient contractor per diems that would be spent in the local economy would amount to approximately $1.86 million in 1997, and would increase to about $2.59 million at project peak in 2006, compared with about $2.5 million in 1996. After 2006, earnings would decline due to the abrupt loss of construction jobs and gradual reduction of employment of RGC CBM field workers.

The reduction in wells that would be drilled, and associated employment and earnings, would also result in smaller indirect and induced economic impacts on the Project Area as well. Based on direct employment and earnings, as well as project purchasing activity, Alternative B1 would create up to 9 additional new jobs in local area communities during the construction phase of the project, beyond what the project created in 1996. After completion of project construction, the reduction in direct employment and earnings would indirectly result in a reduction of service and trade sector jobs. Compared with current conditions, the Project Area would experience a net loss of about 54 service and trade sector jobs over the 20 year production phase and completion of the project.

Similarly, the indirect/induced creation of jobs would generate additional earnings in the local economy that would also be spent in the local area. Based on project-related earnings and purchasing activity, Alternative B1 would indirectly generate up to $158,000 in additional earnings per year during the construction phase of the project above and beyond what the RGC project is currently generating. These indirect earnings would be

generated primarily due to the increased service and trade sector employment. After completion of project construction, the reduction in direct earnings would indirectly result in a reduction of service, trade, and other job sector earnings. Compared with current conditions, the Project Area would experience a net loss of up to $510,000 in indirect earnings per year over the 20 year production phase of the project.

Population, Housing, and Community Facilities and Services

Since the majority of new year-round workers would be recruited from communities within the Project Area, it is likely that only a modest increase in population would occur. The proposed use of non-local construction workers for specialized construction activities would include about the same number of workers that have been used in recent years. Thus, no additional demand for temporary housing would occur in the future. The vast majority of transient construction workers brought in from outside of the Project Area would not bring their families with them and would generally utilize motels and mobile homes for housing. No increase in demand on public schools or other community facilities and services is projected.

Costs and Benefits of the Proposed Project and Local Government Fiscal Conditions

Alternative B1 would result in some costs for the counties in the Project Area, but would also generate benefits for those entities. In general, a net benefit to fiscal conditions is projected as revenues would exceed increased road maintenance costs. These costs and benefits would both be smaller in magnitude than for the Proposed Action due to the reduced number of wells and associated truck traffic and road use, as well as decreased royalty and tax revenues that would be generated.

Estimating the Economic and Quality of Life Costs Associated With the Degradation of Outdoor Recreational Opportunities

Impacts to hunting and other outdoor recreation opportunities would be similar in nature to those described for the Proposed Action, but would be smaller in magnitude, due to reduced disturbance of game habitat and areas used for outdoor recreation. With respect to hunting, using the same assumptions described for the Proposed Action, project-related impacts on game populations would result in a reduction of about $140,000 in elk hunting-related income for the local economy annually, and a $80,000 reduction in deer hunting income annually (about $220,000 combined). These values are again based on healthy elk and deer populations. If game populations are lower than target management levels in the future, the reduction in hunting-related economic activity with Alternative B1 would actually be less than described above.

With respect to outdoor recreation, impacts associated with reduced or degraded recreational opportunities to local area residents would be less than described for the Proposed Action, due to the decreased number of CBM wells and exclusion from certain areas.

Potential Adverse Impacts of an Economic Boom-Bust Cycle

The issues associated with a potential boom-bust cycle for Alternative B1 would be the same as those described for the Proposed Action, although the increase in the number of jobs for local residents at peak of the boom period, and the number of jobs eventually lost

would be smaller (Table 4.15-1) (Figure 4.15-1).

As described previously, Alternative B1 would result in a net increase of about 11 local area jobs at project peak, a layoff of about 19 local construction workers in 1997 and about 23 more in 2007, and then a net loss of about 81 local area jobs at project completion in 2027 (Table 4.15-1). These employment impacts equate to just a 0.5% increase in mining/oil and gas employment at project peak, then about 5.2% in losses of local construction employment in 1997 and 2007, and eventually a 3.5% loss in mining/oil and gas sector employment at project completion. Again, the project-related gains and losses in employment presented have been compared with 1996 employment values, which may be considerably different than actual employment values in the future.

Since this alternative would result in an increase and then a decrease in Project Area employment that is even smaller than under the Proposed Action, it is unlikely that the economy of Carbon and Emery Counties as a whole would "bust" as it did in the early 1980s as a result of the project.

Quality of Life Issues

The issues associated with a quality of life for Alternative B1 would be the same as those described under the Proposed Action, although with reduced development, visual impacts and related impacts to quality of life for some Project Area residents would be reduced.

4.15.2.4 Alternative B2

Employment and Earnings

Alternative B2 would create more jobs in the Project Area, compared with the Proposed Action. Furthermore, direct project employment of construction workers and RGC employees would increase, relative to current conditions over the entire construction phase of the project. During the construction phase, local contractor employment would increase by about 11 positions, and transient contractor positions would increase by about 15 positions, compared with current conditions, due to the increase in wells that would be drilled and completed annually. In addition, RGC would hire an additional four to six new employees annually to maintain the growing CBM field. At project peak, Alternative B2 would result in a net increase of about 74 jobs for Project Area residents, relative to current conditions (Table 4.15-1). At the end of the construction phase, total project employment would decline by 137 positions (98 transient contractor jobs and 39 local contractor jobs lost). Over the following 20 years, as wells go out of production, RGC employment would gradually decline as well (Figure 4.15-1).

Direct project earnings for local area employees, along with transient contractor per diems that would be spent in the local economy would amount to approximately $3.15 million in 1997, and would increase to about $4.36 million at project peak in 2006, compared with about $2.5 million in 1996. After 2006, earnings would decline due to the abrupt loss of construction jobs and gradual reduction of employment of RGC CBM field workers.

The expenditure of direct earnings by project workers and purchases of equipment and supplies by RGC generate additional employment and earnings in the local economy. Based on direct employment and earnings, as well as project purchasing activity, Alternative B2 would create up to 15 additional new jobs in local area communities during the construction phase of the project, beyond what the project created in 1996. After completion of project construction, the reduction in direct employment and earnings would indirectly result in a reduction of service and trade sector jobs. Compared with current conditions, the Project Area would experience a net loss of about 54 service and trade sector jobs over the 20 year production phase and then completion of the project.

Similarly, the indirect/induced creation of jobs would generate additional earnings in the local economy that would also be spent in the local area. Based on project-related earnings and purchasing activity, Alternative B2 would indirectly generate up to $267,000 in additional earnings per year during the construction phase of the project above and beyond what the RGC project is currently generating. These indirect earnings would be generated primarily due to the increased service and trade sector employment. After completion of project construction, the reduction in direct earnings would indirectly result in a reduction of service, trade, and other job sector earnings. Compared with current conditions, the Project Area would experience a net loss of up to $859,000 in indirect earnings per year over the 20 year production phase of the project.

Population, Housing, and Community Facilities and Services

Since the majority of new year-round workers would be recruited from communities within the Project Area, it is likely that only a modest increase in population would occur. The proposed use of non-local construction workers for specialized construction activities would include about 148 workers, which would represent an 18 percent increase above historic levels. This potential increase of 23 non-local workers coming to the Project Area in need of housing would not put a strain on the currently tight rental housing market in the Project Area because temporary housing units, such as motel rooms and mobile homes would generally be used. Little or no increase in demand on public schools or other community facilities and services would occur.

Costs and Benefits of the Proposed Project and Local Government Fiscal Conditions

Alternative B2 would result in some costs for the counties in the Project Area, but would also generate benefits for those entities. Both costs and benefits would be greater in magnitude than for the Proposed Action due to the increase in the number of wells and associated truck traffic and road use; and royalty and tax revenues would be increased.

Estimating the Economic and Quality of Life Costs Associated With the Degradation of Outdoor Recreational Opportunities

Under Alternative B2, impacts to hunting would be less than described for the Proposed Action because CBM well development would be excluded from important game habitat areas. Impacts to outdoor recreation would generally be greater than the Proposed Action because of the increased number and

density of CBM wells in the area that would be developed.

With respect to hunting, using the same assumptions described for the Proposed Action, project-related impacts on game populations would result in a reduction of about $140,000 in elk hunting-related income for the local economy annually, and a $109,000 reduction in deer hunting income annually (about $249,000 combined). These values are again based on healthy elk and deer populations. If game populations are lower than target management levels in the future, the reduction in hunting-related economic activity with Alternative B2 would actually be less than described above.

With respect to outdoor recreation, impacts associated with reduced or degraded recreational opportunities to local area residents would be somewhat greater than described for the Proposed Action, due to the increased number and density of CBM wells, and related visual and truck-related disturbance.

Potential Adverse Impacts of an Economic Boom-Bust Cycle

The issues associated with a potential boom-bust cycle for Alternative B2 would be the same as those described for the Proposed Action, although the increase in the number of jobs for local residents at peak of the boom period, and the number of jobs eventually lost would be greater (Table 4.15-1) (Figure 4.15-1).

As described previously, Alternative B2 would result in a net increase of about 74 local area jobs at project peak, a layoff of about 39 local construction workers in about 2007, and then a net loss of about 81 local area jobs at project completion in 2027 (Table 4.15-1). These employment impacts equate to a 5.8% increase in mining/oil and gas employment at project peak, then an 8.8% loss of local construction employment in 2007, and eventually a 3.5% loss in mining/oil and gas sector employment at project completion. Again, the project-related gains and losses in employment presented have been compared with 1996 employment values, which may be considerably different than actual employment values in the future.

Although this alternative would result in an increase and then a decrease in Project Area employment even greater than under the Proposed Action, given the diversification of the local area economy in recent years, it is unlikely that the economy of Carbon and Emery Counties as a whole would "bust" as it did in the early 1980s as a result of the project, despite the sudden jump in unemployment in the construction industry anticipated.

Quality of Life Issues

The issues associated with a quality of life for Alternative B2 would be the same as those described under the Proposed Action, although with more intensive development overall, visual impacts and related impacts to quality of life for some Project Area residents would be even greater.

4.15.2.5 Alternative C1

Employment and Earnings

Since the number of CBM wells and associated roads would be reduced under this alternative, compared with the Proposed Action, Alternative C1 would create slightly fewer jobs in the Project Area over the life of the project. Furthermore, direct project employment of construction workers would be slightly reduced, relative to current conditions, over the entire construction phase of the project. During the construction phase, local contractor employment would drop by about six positions, and transient contractor employment would drop by about eight positions, compared with current conditions, due to the reduction in wells that would be drilled and completed annually. However, during that period, RGC would hire an additional four or five new employees annually to maintain the growing CBM field. At project peak, RGC would employ about 37 additional local area residents beyond those currently employed by the project (Table 4.15-1). At the end of the construction phase, total project employment would decline by 105 positions (75 transient contractor jobs and 30 local contractor jobs lost). Over the following 20 years, as wells go out of production, RGC employment would gradually decline as well (Figure 4.15-1).

Direct project earnings for local area employees, along with transient contractor per diems that would be spent in the local economy would amount to approximately $2.4 million in 1997, and would increase to about $3.33 million at project peak in 2006, compared with about $2.5 million in 1996. After 2006, earnings would decline due to the abrupt loss of construction jobs and gradual reduction of employment of RGC CBM field workers.

The reduction in wells that would be drilled, and associated employment and earnings, would also result in smaller indirect and induced economic impacts on the Project Area as well. Based on direct employment and earnings, as well as project purchasing activity, Alternative C1 would create up to 12 additional new jobs in local area communities during the construction phase of the project, beyond what the project created in 1996. After completion of project construction, the reduction in direct employment and earnings would indirectly result in a reduction of service and trade sector jobs. Compared with current conditions, the Project Area would experience a net loss of about 54 service and trade sector jobs over the 20 year production phase and completion of the project.

Similarly, the indirect/induced creation of jobs would generate additional earnings in the local economy that would also be spent in the local area. Based on project-related earnings and purchasing activity, Alternative C1 would indirectly generate up to $203,000 in additional earnings per year during the construction phase of the project above and beyond what the RGC project is currently generating. These indirect earnings would be generated primarily due to the increased service and trade sector employment. After completion of project construction, the reduction in direct earnings would indirectly result in a reduction of service, trade, and other job sector earnings. Compared with current conditions, the Project Area would experience a net loss of up to $655,000 in indirect earnings per year over the 20 year production phase of the project.

Population, Housing, and Community Facilities and Services

Since the majority of new year-round workers would be recruited from communities within the Project Area, it is likely that only a modest increase in population would occur. The proposed use of non-local construction workers for specialized construction activities would include about the same number of workers that have been used in recent years. Thus, no additional demand for temporary housing would occur in the future. The vast majority of transient construction workers brought in from outside of the Project Area would not bring their families with them and would generally utilize motels and mobile homes for housing. No increase in demand on public schools or other community facilities and services is projected.

Costs and Benefits of the Proposed Project and Local Government Fiscal Conditions

Alternative C1 would result in some costs for the counties in the Project Area, but would also generate benefits for those entities. These costs and benefits would both be smaller in magnitude than for the Proposed Action due to the reduced number of wells and associated truck traffic and road use, as well as decreased royalty and tax revenues that would be generated. In general, fiscal benefits would exceed costs.

Estimating the Economic and Quality of Life Costs Associated With the Degradation of Outdoor Recreational Opportunities

Impacts to hunting and other outdoor recreation opportunities would be similar in nature to those described for the Proposed Action, but would be smaller in magnitude, due to reduced disturbance of game habitat and areas used for outdoor recreation. With respect to hunting, using the same assumptions described for the Proposed Action, project-related impacts on game populations would result in a reduction of about $126,000 in elk hunting-related income for the local economy annually, and a $159,000 reduction in deer hunting income annually (about $285,000 combined). These values are again based on healthy elk and deer populations. If game populations are lower than target management levels in the future, the reduction in hunting-related economic activity with Alternative C1 would actually be less than described above.

With respect to outdoor recreation, impacts associated with reduced or degraded recreational opportunities to local area residents would be slightly less than described for the Proposed Action, due to the decreased number of CBM wells and exclusion from certain areas.

Potential Adverse Impacts of an Economic Boom-Bust Cycle

The issues associated with a potential boom-bust cycle for Alternative C1 would be the same as those described for the Proposed Action, although the increase in the number of jobs for local residents at peak of the boom period, and the number of jobs eventually lost would be smaller (Table 4.15-1) (Figure 4.15-1).

As described previously, Alternative C1 would result in a net increase of about 37 local area jobs at project peak, a layoff of about 6 local construction workers in 1997 and about 30 more in 2007, and then a net loss of about 81 local area jobs at project completion in 2027 (Table 4.15-1). These employment impacts equate to just a 1.6% increase in mining/oil and gas employment at project peak, then about 6.8% in losses of

local construction employment in 1997 and 2007, and eventually a 3.5% loss in mining/oil and gas sector employment at project completion. Again, the project-related gains and losses in employment presented have been compared with 1996 employment values, which may be considerably different than actual employment values in the future.

Since this alternative would result in an increase and then a decrease in Project Area employment that is even smaller than under the Proposed Action, it is unlikely that the economy of Carbon and Emery Counties as a whole would "bust" as it did in the early 1980s as a result of the project.

Quality of Life Issues

The issues associated with a quality of life for Alternative C1 would be the same as those described under the Proposed Action, although with reduced development, visual impacts and related impacts to quality of life for some Project Area residents would be slightly reduced.

4.15.2.6 Alternative C2

Employment and Earnings

Alternative C2 would create more jobs in the Project Area, compared with the Proposed Action. Furthermore, direct project employment of construction workers and RGC employees would increase, relative to current conditions over the entire construction phase of the project. During the construction phase, local contractor employment would increase by about 43 positions, and transient contractor positions would increase by about 56 positions, compared with current conditions, due to the increase in wells that would be drilled and completed annually. In addition, RGC would hire an additional eight or nine new employees annually to maintain the growing CBM field. At project peak, employment of local area residents would increase by about 139 additional workers, relative to current conditions (Table 4.15-1). At the end of the construction phase, total project employment would decline by 195 positions (139 transient contractor jobs and 56 local contractor jobs lost). Over the following 20 years, as wells go out of production, RGC employment would gradually decline as well (Figure 4.15-1).

Direct project earnings for local area employees, along with transient contractor per diems that would be spent in the local economy would amount to approximately $4.49 million in 1997, and would increase to about $6.21 million at project peak in 2006, compared with about $2.5 million in 1996. After 2006, earnings would decline due to the abrupt loss of construction jobs and gradual reduction of employment of RGC CBM field workers.

The expenditure of direct earnings by project workers and purchases of equipment and supplies by RGC generate additional employment and earnings in the local economy. Based on direct employment and earnings, as well as project purchasing activity, Alternative C2 would create up to 22 additional new jobs in local area communities during the construction phase of the project, beyond what the project created in 1996. After completion of project construction, the reduction in direct employment and earnings would indirectly result in a reduction of service and trade sector jobs. Compared with current conditions, the Project Area would experience a net loss of about 54 service and trade sector jobs over the 20 year production phase and completion of the project.

Similarly, the indirect/induced creation of jobs would generate additional earnings in the local economy that would also be spent in the local area. Based on project-related earnings and purchasing activity, Alternative C2 would indirectly generate up to $380,000 in additional earnings per year during the construction phase of the project above and beyond what the RGC project is currently generating. These indirect earnings would be generated primarily due to the increased service and trade sector employment. After completion of project construction, the reduction in direct earnings would indirectly result in a reduction of service, trade, and other job sector earnings. Compared with current conditions, the Project Area would experience a net loss of up to $1.2 million in indirect earnings per year over the 20 year production phase of the project.

Population, Housing, and Community Facilities and Services

Since the majority of new year-round workers would be recruited from communities within the Project Area, it is likely that only a modest increase in population would occur. The proposed use of non-local construction workers for specialized construction activities would include about 210 workers, which would represent an 68 percent increase above historic levels. This potential increase of 85 non-local workers coming to the Project Area in need of housing would not put a strain on the currently tight rental housing market in the Project Area because temporary housing units, such as motel rooms and mobile homes would generally be used. Little or no increase in demand on public schools or other community facilities and services would occur.

Costs and Benefits of the Proposed Project and Local Government Fiscal Conditions

Alternative C2 would result in some costs for the counties in the Project Area due to increased road maintenance, but would also generate greater benefits for those entities. These costs and benefits would both be greater in magnitude than for the Proposed Action due to the increase in the number of wells and associated truck traffic and road use, as well as increased royalty and tax revenues that would be generated. In general, the fiscal benefits would greatly exceed increased costs in the Project Area.

Estimating the Economic and Quality of Life Costs Associated With the Degradation of Outdoor Recreational Opportunities

Under Alternative C2, exclusion of development from small critical habitat areas would slightly reduce the impacts to elk hunting relative to the Proposed Action, but would increase the impact to deer hunting and outdoor recreation relative to the Proposed Action because of the increased number and density of CBM wells in the area that would be developed.

With respect to hunting, using the same assumptions described for the Proposed Action, project-related impacts on game populations would result in a reduction of about $140,000 in elk hunting-related income for the local economy annually, and a $199,000 reduction in deer hunting income annually (about $339,000 combined). These values are again based on healthy elk and deer populations. If game populations are lower than target management levels in the future, the reduction in hunting-related economic activity with Alternative C2 would actually be less than described above.

With respect to outdoor recreation, impacts associated with reduced or degraded recreational opportunities to local area residents would be greater than described for the Proposed Action, due to the increased number and density of CBM wells, and related visual and truck-related disturbance.

Potential Adverse Impacts of an Economic Boom-Bust Cycle

The issues associated with a potential boom-bust cycle for Alternative C2 would be the same as those described for the Proposed Action, although the increase in the number of jobs for local residents at peak of the boom period, and the number of jobs eventually lost would be greater (Table 4.15-1)(Figure 4.15-1).

As described previously, Alternative C2 would result in a net increase of about 139 local area jobs at project peak, a layoff of about 56 local construction workers in about 2007, and then a net loss of about 81 local area jobs at project completion in 2027 (Table 4.15-1). These employment impacts equate to a 14.8% increase in mining/oil and gas employment at project peak, then a 12.6% loss of local construction employment in 2007, and eventually a 3.5% loss in mining/oil and gas sector employment at project completion. Again, the project-related gains and losses in employment presented have been compared with 1996 employment values, which may be considerably different than actual employment values in the future.

Although this alternative would result in an increase and then a decrease in Project Area employment even greater than under the Proposed Action, given the diversification of the local area economy in recent years, it is unlikely that the economy of Carbon and Emery Counties as a whole would "bust" as it did in the early 1980s as a result of the project, despite the sudden jump in unemployment in the construction industry anticipated.

Quality of Life Issues

The issues associated with a quality of life for Alternative C2 would be the same as those described under the Proposed Action, although with more intensive development overall, visual impacts and related impacts to quality of life for some Project Area residents would be even greater.

4.15.2.7 No Action Alternative

Employment and Earnings

Since the number of CBM wells and associated roads would be substantially reduced under this alternative, compared with the Proposed Action, the No Action alternative would create fewer jobs in the Project Area over the life of the project. Furthermore, direct project employment of construction workers would be reduced, relative to current conditions over the entire construction phase of the project. During the construction phase, local contractor employment would drop by about 35 positions, and transient contractor employment would drop by about 46 positions, compared with current conditions, due to the reduction in wells that would be drilled and completed annually. During that period, RGC would hire an additional two new employees annually to maintain the growing CBM field. At project peak, RGC would employ about 13 additional local area workers beyond those currently employed by the project, although total local resident employment, including local construction workers, would be 22 positions fewer than in 1996 (Table 4.15-1). At the end of the

construction phase, total project employment would decline by 52 positions (37 transient contractor jobs and 14 local contractor jobs lost). Over the following 20 years, as wells go out of production, RGC employment would gradually decline as well (Figure 4.15-1).

Direct project earnings for local area employees, along with transient contractor per diems that would be spent in the local economy would amount to approximately $1.20 million in 1997, and would increase to about $1.66 million at project peak in 2006, compared with about $2.5 million in 1996. Thus, even at project peak, the No Action alternative would generate fewer earnings than under current conditions. After 2006, earnings would decline due to the abrupt loss of construction jobs and gradual reduction of employment of RGC CBM field workers.

The considerable reduction in wells that would be drilled, and associated employment and earnings, would also result in smaller indirect and induced economic impacts on the Project Area as well. Based on the reduction in direct employment and earnings, as well as project purchasing activity, the No Action alternative would result in a decline of about 10 jobs in local area communities during the construction phase of the project, beyond what the project created in 1996. After completion of project construction, the reduction in direct employment and earnings would indirectly result in a reduction of service and trade sector jobs. Compared with current conditions, the Project Area would experience a net loss of about 54 service and trade sector jobs over the 20 year production phase and then completion of the project.

Similarly, the indirect/induced loss of jobs due to project reduction, would reduce earnings in the local economy in the local area. Based on project-related earnings and purchasing activity, the No Action alternative would result in a loss of about $150,000 in earnings per year during the construction phase of the project, relative to what the project is currently generating. After completion of project construction, the further reduction in direct earnings would indirectly result in a reduction of service, trade, and other job sector earnings. Compared with current conditions, the Project Area would experience a net loss of up to $328,000 in indirect earnings per year over the 20 year production phase of the project.

Population, Housing, and Community Facilities and Services

Since the majority of new year-round workers would be recruited from communities within the Project Area, it is likely that little or no increase in population would occur. The proposed use of non-local construction workers for specialized construction activities would include fewer workers than have been used in recent years. Thus, there would be a decrease in demand for temporary housing in the future. There would be no impact to public schools or other community facilities and services under this alternative.

Costs and Benefits of the Proposed Project and Local Government Fiscal Conditions

The No Action alternative would result in some costs for the counties in the Project Area, but would also generate benefits for those entities. These costs and benefits would both be smaller in magnitude than for the Proposed Action due to the reduced number of wells and associated truck traffic and road use, as well as decreased royalty and tax revenues that would be generated.

Estimating the Economic and Quality of Life Costs Associated With the Degradation of Outdoor Recreational Opportunities

Impacts to hunting and other outdoor recreation opportunities would be similar in nature to those described for the Proposed Action, but would be considerably smaller in magnitude, due to reduced disturbance of game habitat and areas used for outdoor recreation. With respect to hunting, using the same assumptions described for the Proposed Action, project-related impacts on game populations would result in a reduction of about $84,000 in elk hunting-related income for the local economy annually, and a $80,000 reduction in deer hunting income annually (about $184,000 combined). These values are again based on healthy elk and deer populations. If game populations are lower than target management levels in the future, the reduction in hunting-related economic activity with the No Action alternative would actually be less than described above.

With respect to outdoor recreation, impacts associated with reduced or degraded recreational opportunities to local area residents would be considerably less than described for the Proposed Action, due to the decreased number of CBM wells and exclusion from areas managed by the BLM.

Potential Adverse Impacts of an Economic Boom-Bust Cycle

Given the considerably smaller scale of the No Action alternative, employment would actually be reduced, relative to current conditions over the entire life of the project. Hiring by RGC during the construction phase, and then subsequent reductions in employment would smaller in scale than for the Proposed Action and other alternatives (Table 4.15-1) (Figure 4.15-1). Even at project peak, the project would result in a net reduction of 22 jobs for local workers (0.9% of total mining/oil and gas and construction employment), compared with current conditions. After completion of the modest construction phase, about 14 local construction jobs would be lost (3.2% of the construction industry), and then a net loss of 81 positions at project completion (3.5% of total mining/oil and gas and construction employment). Again, the project-related gains and losses in employment presented have been compared with 1996 employment values, which may be considerably different than actual employment values in the future.

Since this alternative would result in employment impacts that would be considerably smaller than under the Proposed Action, it is unlikely that the economy of Carbon and Emery Counties as a whole would "bust" as it did in the early 1980s as a result of the project.

Quality of Life Issues

The issues associated with a quality of life for this alternative would be the same as those described under the Proposed Action, although with significantly reduced development on state and private lands only, visual impacts and related impacts to quality of life for some Project Area residents would be reduced considerably.

4.15.3 Impacts Summary

A summary comparison of impacts of the Proposed Action and alternatives is provided in Table 2.7-2.

With the exception of the No Action alternative, all of the project alternatives would result in additional employment in the Project Area beyond current conditions,

although the numbers of jobs and related earnings vary by alternative (Table 4.15-2). Most of the project workers would be recruited from the Project Area, so the potential influx of workers and associated population increase would be modest in scale. Accordingly, only modest increases in demand for community facilities (such as schools) and services (such as police and fire protection) is anticipated for all project alternatives. Earnings generated by the project would be spent in the Project Area economy for housing, food, and goods and services, thereby creating additional trade and service sector jobs and earnings.

The proposed project and all alternatives would generate substantial revenue for the state and various local government entities through payment of royalties and taxes. These payments or fiscal benefits would vastly exceed any costs the project would have on local services, such as county road maintenance. These revenues would be used by the cities and counties for funding a variety of services and possibly the development of new community facilities and infrastructure in general. Although the rise and fall of project employment, earnings, and government revenues could be perceived as creating another boom-bust cycle, the scale of employment and earnings impacts is small, relative to the local economy as a whole. To the extent the project's revenue contributions would finance infrastructure and other community facilities, it would generate long-term benefits that would last well beyond the end of the project itself. Reduction in hunting opportunities due to impacted game populations, as well as reduction in the quality of outdoor recreation experiences would have additional negative economic impacts on the local communities. These impacts would vary by alternative.

In terms of quality of life issues, some residents of the Project Area perceive the development of the CBM field as degrading recreational opportunities in the Project Area, while others value the creation of new jobs that pay relatively good wages.

4.15.4 Mitigation

In addition to conforming with Visual Resource Management objectives in the project development area, a commitment by RGC to maintain clean working areas would minimize unsightly debris and perceived degradation of the Project Area. This mitigation measure would help to reduce potential impacts to the attractiveness of the Project Area and associated quality of life for those concerned. Moreover, the hiring of local workers to the maximum extent possible would minimize the influx of new population and associated demand on schools and other community facilities and services.

4.15.5 Unavoidable Adverse Impacts

There would be no significant unavoidable adverse impacts to socioeconomic conditions or quality of life associated with any of the project alternatives under consideration.

4.16 HEALTH AND SAFETY

4.16.1 Introduction

Potential risks associated with implementation of well field development under any of the alternatives would include:

- Human-caused wildfire ignitions
- Natural (CBM) gas flowline leakage, rupture, and possible fire and/or explosion

- Risks associated with well field construction and operations

Refer to Section 1.6.2 for a discussion of hydrogen sulfide releases to the atmosphere.

4.16.2 Direct and Direct impacts

4.16.2.1 Proposed Action

The BLM recognizes that increased human use of lands within the Project Area can lead to increased risk of wildfire. Use of the area by construction crews and the general public is of concern; however, construction and operating personnel would be required to adhere to fire prevention measures in all authorized activities (Appendix 2D). Use of the area by the general public should not lead to an increased risk of fire. All wildfires endangering life or property will be suppressed.

The potential for natural (CBM) gas flowline/pipeline leaks or ruptures exists for the proposed project. According to the DOT, an average rupture frequency of 1 rupture per 5,000 miles of pipeline could be expected. Most ruptures are the result of heavy equipment accidentally striking the pipeline while operating in close proximity to the gas pipeline. Such ruptures could lead to a fire and/or explosion should a spark or open flame ignite the gas being released from the rupture.

Pipeline design, materials, construction, operations, maintenance, and abandonment practices shall be in accordance with safe and proven engineering practices and shall meet or exceed the DOT regulations (49 CFR Part 192, Transportation of Natural and Other Gas by Pipelines: Minimum Federal Safety Standards) and standard construction specifications recommended by the American Society of Mechanical Engineers (ASME-31.8) and the American Petroleum Institute (API Standard 1004). Adherence to these standards during construction and testing would likely reduce the potential for leaks or pipeline failure to a minimal probability. Frequent signing of gas pipeline ROW and placement of colored warning tape above the pipeline in the trench would reduce the risk of accidental ruptures from excavating equipment.

Risks associated with construction of wellsites, access roads, pipelines, electrical distribution lines, and ancillary facilities, and well drilling, completion, and production operations would approximate impacts associated with heavy construction and industry. During 1992, a total of 12,100 workdays were lost in the oil and gas extraction industry (U.S. Department of Labor 1994). Of this total, 2,600 days were lost in the area of crude petroleum and natural gas production; the remaining 9,500 lost workdays occurred in the oil and gas field services area. Injury- and illness-related lost workdays for the oil and gas industry were nearly double the rate for similar activities in the mining industry. These potential risks associated with the oil and gas industry would be limited to employees and subcontractors and would not affect the public. Issues and concerns regarding increased traffic on field development and public roads are addressed in Section 4.10 of this EIS.

4.16.2.2 Alternative A

Risks/impacts from construction, operations, and abandonment of the well field would be similar to those described for the Proposed Action; however, the probability, although small, of incidence would increase due to the greater level of development associated with this alternative.

4.16.2.3 Alternative B1

Risks/impacts from construction, operations, and abandonment of the well field would be similar to those described for the Proposed Action; however, the probability, although small, of incidence would be less due to the reduced level of development associated with this alternative in comparison to the Proposed Action.

4.16.2.4 Alternative B2

Risks/impacts from construction, operations, and abandonment of the well field would be similar to those described for the Proposed Action; however, the probability, although small, of incidence would increase due to the greater level of development associated with this alternative in comparison to the Proposed Action.

4.16.2.5 Alternative C1

Risk and impacts would be similar in type, but reduced in probability due to the reduced numbers of facilities.

4.16.2.6 Alternative C2

Risk and impacts would be similar, but increased due to the larger amount of facilities.

4.16.2.7 No Action Alternative

Risks/impacts from construction, operations, and abandonment of the well field would be similar to those described for the Proposed Action; however, the probability, although small, of incidence would be less due to the reduced level of development associated with this alternative in comparison to the Proposed Action.

4.16.3 Impacts Summary

A summary comparison of impacts of the Proposed Action and alternatives is provided in Table 2.7-2.

Hazards associated with the well field development program, including construction, operations, and abandonment activities, are those hazards normally associated with the oil and gas extraction industry. A minimal risk to the public does exist for the spread of wildfire accidentally initiated by industry employees or contractors; however, the risk is minimized by the relative absence of public habitation in proximity to proposed CBM facilities.

4.16.4 Mitigation

As the potential risks to health and safety are minimal for the Proposed Action and alternatives, no additional mitigation measures beyond those presented or referenced in Section 2 would be required.

4.16.5 Unavoidable Adverse Impacts

Minimal risks to the health and safety of primarily CBM workers, and to a lesser extent, the public would be present for the life of the project.

Chapter 4.0
Figures

Chapter 5.0

Chapter 4.0
Tables

TABLE 4.2-1
SUMMARY OF PROJECT FEATURES RELATED TO
TO WATER RESOURCE IMPACTS

Alternatives	Acres Disturbed Short-Term	Acres Disturbed Long-Term	Roads Crossing 330-ft Buffer of Perennial Streams	Roads Crossing 660-ft Buffer of Springs	Peak Water Produced - BWPD (ac-ft/day)	Total Disposal Capacity - Injection Wells - BWPD (ac-ft/day)	Total Disposal Capacity - Evaporation Ponds - BWPD (ac-ft/day)	Total Disposal Capacity - BWPD (ac-ft/day)	Total Construction and Operational Fresh Water Needs - ac-ft
PROPOSED ACTION 160-acre Spacing	4,095	2,352	20	11	107,000 (13.8)	76,000 (9.8)	50,000 (6.4)	126,000 (16.2)	494
ALTERNATIVE A 180-acre Spacing	5,758	3,585	29	18	130,500 (16.8)	86,000 (11.1)	55,000 (7.1)	141,000 (18.2)	852
ALTERNATIVE B1 Critical Areas Avoidance 160-acre Spacing	3,151	1,818	20	9	86,500 (11.2)	56,000 (7.2)	40,000 (5.2)	96,000 (12.4)	360.5
ALTERNATIVE B2 Critical Areas Avoidance 80-acre Spacing	4,510	2,775	26	13	119,359 (15.4)	76,000 (7.2)	50,000 (5.2)	126,000 (12.4)	632.5
ALTERNATIVE C1 Security Areas Protection 160-acre Spacing	3,778	2,170	20	10	96,250 (12.4)	76,000 (7.2)	50,000 (5.2)	126,000 (12.4)	448.3
ALTERNATIVE C2 Security Areas Protection 80-acre Spacing	5,318	3,306	29	17	129,500 (16.7)	86,000 (11.1)	55,000 (7.1)	141,000 (18.2)	783.3
NO ACTION	1,907	1,050	18	5	58,000 (7.4)	46,000 (5.9)	35,000 (4.5)	81,000 (10.4)	197.6

TABLE 4.3-1

PROJECTED PROJECT AIR QUALITY IMPACTS,
STATE AND FEDERAL AIR QUALITY STANDARDS

Pollutant	Averaging Time	PSD Class II Increment (ug/m^3)	NAAQS Standard (ug/m^3)	Maximum Predicted (ug/m^3)	Percent of NAAQS Standard
Proposed Action - 160-acre Spacing					
Nitrogen Dioxide	annual	25	100	20	20
Carbon Monoxide	1-hour	-	40,000	815	2
	8-hour	-	10,000	533	5
Alternative A - 80-acre Spacing					
Nitrogen Dioxide	annual	25	100	22.5	23
Carbon Monoxide	1-hour	-	40,000	917	2
	8-hour	-	10,000	599	6
Alternative B1 - Critical Areas Avoidance - 160-acre Spacing					
Nitrogen Dioxide	annual	25	100	5	5
Carbon Monoxide	1-hour	-	40,000	238	1
	8-hour	-	10,000	133	1
Alternative B2 - Critical Areas Avoidance - 80-acre Spacing					
Nitrogen Dioxide	annual	25	100	9	9
Carbon Monoxide	1-hour	-	40,000	349	1
	8-hour	-	10,000	228	2
Alternative C1 - Security Areas Protection - 160-acre Spacing					
Nitrogen Dioxide	annual	25	100	8	8
Carbon Monoxide	1-hour	-	40,000	239	1
	8-hour	-	10,000	133	1
Alternative C2 - Security Areas Protection - 80-acre Spacing					
Nitrogen Dioxide	annual	25	100	19	19
Carbon Monoxide	1-hour	-	40,000	769	2
	8-hour	-	10,000	484	5
No Action Alternative					
Nitrogen Dioxide	annual	25	100	10	10
Carbon Monoxide	1-hour	-	40,000	432	1
	8-hour	-	10,000	282	3

TABLE 4.4-1

ACRES OF SENSITIVE SOILS IMPACTED

Proposed Action - 160-Acre Well Spacing

	Short-Term Construction						Long-Term Operation					
	Acres Affected					Percent of Total	Acres Affected					Percent of Total
Soil Constraints	BLM	State	Private	UDWR	Total	Disturbance	BLM	State	Private	UDWR	Total	Disturbance
High Salinity	548	195	493	0	1,236	30	338	136	292	0	766	19
High Erosion	645	203	242	35	1,125	27	381	134	137	17	669	16
Unsuitable Reclamation Material	87	22	41	1	151	4	51	14	23	0	88	2
Total	**1,280**	**420**	**776**	**36**	**2,512**	**61**	**770**	**284**	**452**	**17**	**1,523**	**37**
Overlap of Soil Constraints												
High Salinity and High Erosion*	285	109	133	0	527	13	176	75	77	0	328	8
High Erosion and Unsuitable Reclamation Material*	79	17	20	0	116	3	47	11	12	0	70	2

Alternative A - 80-acre Well Spacing

	Short-Term Construction						Long-Term Operation					
	Acres Affected					Percent of Total	Acres Affected					Percent of Total
Soil Constraints	BLM	State	Private	UDWR	Total	Disturbance	BLM	State	Private	UDWR	Total	Disturbance
High Salinity	773	438	718	0	1,929	34	496	304	447	0	1,247	22
High Erosion	870	353	329	38	1,590	28	544	238	196	20	998	17
Unsuitable Reclamation	120	31	55	1	207	4	75	20	34	0	129	2
Total	**1,763**	**822**	**1,102**	**39**	**3,726**	**66**	**1,115**	**562**	**677**	**20**	**2,374**	**41**
Overlap of Soil Constraints												
High Salinity and High Erosion*	400	222	197	0	819	14	256	154	119	0	529	9
High Erosion and Unsuitable Reclamation Material*	107	22	31	0	160	3	67	14	21	0	102	2

TABLE 4.4-1

ACRES OF SENSITIVE SOILS IMPACTED

No Action Alternative

	Short-Term Construction						Long-Term Operation					
	Acres Affected					Percent of Total Disturbance	Acres Affected					Percent of Total Disturbance
Soil Constraints	BLM	State	Private	UDWR	Total		BLM	State	Private	UDWR	Total	
High Salinity	134	162	428	0	724	38	77	120	259	0	456	24
High Erosion	141	176	192	19	528	28	66	120	109	8	303	16
Unsuitable Reclamation	22	21	32	1	76	4	11	13	17	0	41	2
Total	**297**	**359**	**652**	**20**	**1,328**	**70**	**154**	**253**	**385**	**8**	**800**	**42**
Overlap of Soil Constraints												
High Salinity and High Erosion*	19	90	112	0	221	12	34	65	66	0	165	9
High Erosion and Unsuitable Reclamation Material*	22	17	11	0	50	3	11	11	7	0	29	2

* These two categories are a subset of the primary sensitive soils categories. Acres Affected are included in the total for the primary categories.

TABLE 4.5-1

DIRECT IMPACTS TO VEGETATION

Proposed Action - 160-Acre Well Spacing

Vegetation Types	Acres Affected		Affected Area as a Percent of Total in Study Area		Percent of Impacted Area	
	Construction	Operation	Construction	Operation	Construction	Operation
Agriculture	237	145	2	1	5.8	6.2
Barren	0	0	0	0	0.0	0.0
Montane/Sub-alpine	0	0	0	0	0.0	0.0
Mountain Shrub	1	<1	0	<0.1	0.0	<0.1
Pinyon/Juniper	470	275	1	1	11.5	11.7
Riparian	73	42	1	1	1.8	1.8
Sagebrush/Grass	2,308	1,323	3	2	56.4	56.2
Salt Desert	996	562	2	1	24.3	23.9
Urban	10	6	0	0	0.2	0.3
Water	0	0	0	0	0.0	0.0
Total	4,095	2,353	2	1	100.0	100.0

Alternative A - 80 Acre Well Spacing

Vegetation Types	Acres Affected		Affected Area as a Percent of Total in Study Area		Percent of Impacted Area	
	Construction	Operation	Construction	Operation	Construction	Operation
Agriculture	347	221	2	1	6.0	6.2
Barren	0	0	0	0	0.0	0.0
Montane/Sub-alpine	0	0	0	0	0.0	0.0
Mountain Shrub	1	<1	0	<0.1	0.0	<0.1
Pinyon/Juniper	658	412	2	1	11.4	11.5
Riparian	100	63	2	1	1.7	1.8
Sagebrush/Grass	3,053	1,909	4	2	53.0	53.2
Salt Desert	1,589	974	3	2	27.6	27.2
Urban	10	6	0	0	0.2	0.2
Water	0	0	0	0	0.0	0.0
Total	5,758	3,585	3	2	100.0	100.0

TABLE 4.5-1

DIRECT IMPACTS TO VEGETATION

Alternative B1 - Critical Areas Avoidance - 160-Acre Well Spacing

Vegetation Types	Acres Affected		Affected Area as a Percent of Total in Study Area		Percent of Impacted Area	
	Construction	Operation	Construction	Operation	Construction	Operation
Agriculture	234	144	2	1	7.9	7.9
Barren	0	0	0	0	0.0	0.0
Montane/Sub-alpine	0	0	0	0	0.0	0.0
Mountain Shrub	1	<1	0	<0.1	0.0	<0.1
Pinyon/Juniper	235	126	1	0	7.5	6.9
Riparian	73	42	1	1	2.3	2.3
Sagebrush/Grass	1,643	965	2	1	52.1	53.1
Salt Desert	963	540	2	1	30.6	29.7
Urban	2	1	0	0	0.1	0.1
Water	0	0	0	0	0.0	0.0
Total	3,151	1,818	2	1	100.0	100.0

Alternative B2 - Critical Areas Avoidance - 80-Acre Well Spacing

Vegetation Types	Acres Affected		Affected Area as a Percent of Total in Study Area		Percent of Impacted Area	
	Construction	Operation	Construction	Operation	Construction	Operation
Agriculture	346	221	2	1	7.7	8.0
Barren	0	0	0	0	0.0	0.0
Montane/Sub-alpine	0	0	0	0	0.0	0.0
Mountain Shrub	1	<1	0	<0.1	0.0	<0.1
Pinyon/Juniper	325	188	1	1	7.2	6.8
Riparian	100	63	2	1	2.2	2.3
Sagebrush/Grass	2,209	1,369	3	2	49.0	49.3
Salt Desert	1,527	933	3	2	33.9	33.6
Urban	2	1	0	0	0.0	0.0
Water	0	0	0	0	0.0	0.0
Total	4,510	2,775	2	1	100.0	100.0

TABLE 4.5-1

DIRECT IMPACTS TO VEGETATION

Alternative C1 - Security Areas Protection - 160-Acre Well Spacing

Vegetation Types	Acres Affected		Affected Area as a Percent of Total in Study Area		Percent of Impacted Area	
	Construction	Operation	Construction	Operation	Construction	Operation
Agriculture	237	144	2	1	6.3	6.6
Barren	0	0	0	0	0.0	0.0
Montane/Sub-alpine	0	0	0	0	0.0	0.0
Mountain Shrub	1	<1	0	<0.1	0.0	<0.1
Pinyon/Juniper	408	236	1	1	10.8	10.9
Riparian	73	42	1	1	1.9	1.9
Sagebrush/Grass	2,053	1,179	3	1	54.3	54.3
Salt Desert	996	563	2	1	26.4	25.9
Urban	10	6	0	0	0.3	0.3
Water	0	0	0	0	0.0	0.0
Total	3,778	2,170	2	1	100.0	100.0

Alternative C2 - Security Areas Protection - 80-Acre Well Spacing

Vegetation Types	Acres Affected		Affected Area as a Percent of Total in Study Area		Percent of Impacted Area	
	Construction	Operation	Construction	Operation	Construction	Operation
Agriculture	347	221	2	1	6.5	6.7
Barren	0	0	0	0	0.0	0.0
Montane/Sub-alpine	0	0	0	0	0.0	0.0
Mountain Shrub	1	<1	0	<0.1	0.0	<0.1
Pinyon/Juniper	560	347	2	1	10.5	10.5
Riparian	100	62	2	1	1.9	1.9
Sagebrush/Grass	2,712	1,696	3	2	51.0	51.3
Salt Desert	1,588	974	3	2	29.9	29.5
Urban	10	6	0	0	0.2	0.2
Water	0	0	0	0	0.0	0.0
Total	5,318	3,306	3	2	100.0	100.1

TABLE 4.5-1

DIRECT IMPACTS TO VEGETATION

No Action Alternative

Vegetation Types	Acres Affected		Affected Area as a Percent of Total in Study Area		Percent of Impacted Area	
	Construction	Operation	Construction	Operation	Construction	Operation
Agriculture	217	134	1	1	11.3	12.7
Barren	0	0	0	0	0.0	0.0
Montane/Sub-alpine	0	0	0	0	0.0	0.0
Mountain Shrub	1	<1	0	<0.1	0.0	<0.1
Pinyon/Juniper	171	86	1	0	9.0	8.2
Riparian	57	33	1	1	3.0	3.1
Sagebrush/Grass	956	539	1	1	50.1	51.4
Salt Desert	505	258	1	1	26.5	24.5
Urban	0	0	0	0	0.0	0.0
Water	0	0	0	0	0.0	0.0
Total	1,907	1,050	1	1	99.9	100.0

TABLE 4.7-1
ANALYSIS OF DIRECT IMPACTS ON DEER BY ALTERNATIVE

Habitat Type	Total Areas of Habitat Available in Project Area	Acres Affected					
		Construction			Operation		
		Federal Lands*	Non-federal Lands	Total	Federal Lands*	Non-federal Lands	Total
Proposed Action - 160-acre Spacing							
Critical Winter	53,870	889	452	1,341	520	234	754
High Value Winter	51,809	690	501	1,191	416	296	712
Critical Summer	1,285	0	0	0	0	0	0
Limited Value Yearlong	77,005	840	721	1,561	479	406	885
Alternative A - 80-acre Spacing							
Critical Winter	53,870	1,206	628	1,834	752	390	1,142
High Value Winter	51,809	904	604	1,508	572	371	943
Critical Summer	1,285	0	0	0	0	0	0
Limited Value Yearlong	77,005	1,218	1,189	2,407	758	731	1,489
Alternative B1 - Critical Areas Avoidance - 160-acre Spacing							
Critical Winter	53,870	131	405	536	45	243	288
High Value Winter	51,809	581	470	1,051	348	282	630
Critical Summer	1,285	0	0	0	0	0	0
Limited Value Yearlong	77,005	840	722	1,562	495	406	901
Alternative B2 - Critical Areas Avoidance - 80-acre Spacing							
Critical Winter	53,870	164	594	758	61	378	439
High Value Winter	51,809	768	578	1,346	480	360	840
Critical Summer	1,285	0	0	0	0	0	0
Limited Value Yearlong	77,005	1,205	1,198	2,403	751	741	1,492
Alternative C1 - Security Areas Protection - 160-acre Spacing							
Critical Winter	53,870	709	423	1,132	415	221	636
High Value Winter	51,809	630	455	1,085	380	269	649
Critical Summer	1,285	0	0	0	0	0	0
Limited Value Yearlong	77,005	840	721	1,561	479	406	885
Alternative C2 - Security Areas Protection - 80-acre Spacing							
Critical Winter	53,870	955	555	1,510	591	345	936
High Value Winter	51,809	845	547	1,392	535	336	871
Critical Summer	1,285	0	0	0	0	0	0
Limited Value Yearlong	77,005	1,218	1,189	2,407	758	727	1,485
No Action Alternative							
Critical Winter	53,870	110	402	512	40	239	279
High Value Winter	51,809	121	431	552	61	260	321
Critical Summer	1,285	0	0	0	0	0	0
Limited Value Yearlong	77,005	213	630	843	89	361	450

* Include federal surface and/or mineral ownership. These areas would be mitigated on a 1:1 basis per Environmental Protection Measure BLM 38.

TABLE 4.7-2
ANALYSIS OF INDIRECT IMPACTS ON DEER BY ALTERNATIVE

Habitat Types	Total Acres of Habitat Available in Project Area	Loss of Habitat Value					
		Federal Lands*		Non-Federal Lands		Total Lands	
		Acres	Percent	Acres	Percent	Acres	Percent
Proposed Action - 160-acre Spacing							
Critical Winter	53,870	6,376	12	3,904	7	10,280	19
High Value Winter	51,809	7,692	15	3,443	7	11,135	21
Critical Summer	1,285	0	0	0	0	0	0
Limited value Yearlong	77,005	11,717	15	9,236	12	20,953	27
Alternative A - 80-acre Spacing							
Critical Winter	53,870	7,994	15	5,033	9	13,027	24
High Value Winter	51,809	9,458	18	3,910	8	13,368	26
Critical Summer	1,285	0	0	0	0	0	0
Limited value Yearlong	77,005	16,475	21	15,241	20	31,716	41
Alternative B1 - Critical Areas Avoidance - 160-acre Spacing							
Critical Winter	53,870	1,109	2	3,571	7	4,680	9
High Value Winter	51,809	7,290	14	3,300	6	10,590	20
Critical Summer	1,285	0	0	0	0	0	0
Limited value Yearlong	77,005	11,714	15	9,250	12	20,964	27
Alternative B2 - Critical Areas Avoidance - 80-acre Spacing							
Critical Winter	53,870	1,438	3	4,766	9	6,204	12
High Value Winter	51,809	8,985	17	3,795	7	12,780	25
Critical Summer	1,285	0	0	0	0	0	0
Limited value Yearlong	77,005	15,913	21	15,690	20	31,603	41
Alternative C1 - Security Areas Protection - 160-acre Spacing							
Critical Winter	53,870	5,397	10	3,719	7	9,116	17
High Value Winter	51,809	7,438	14	3,186	6	10,624	21
Critical Summer	1,285	0	0	0	0	0	0
Limited value Yearlong	77,005	11,717	15	9,236	12	20,953	27
Alternative C2 - Security Areas Protection - 80-acre Spacing							
Critical Winter	53,870	6,783	13	4,654	9	11,437	21
High Value Winter	51,809	9,203	18	3,677	7	12,880	25
Critical Summer	1,285	0	0	0	0	0	0
Limited value Yearlong	77,005	16,475	21	15,241	20	31,716	41
No Action Alternative							
Critical Winter	53,870	934	2	3,395	6	4,329	8
High Value Winter	51,809	1,476	3	2,942	6	4,418	9
Critical Summer	1,285	0	0	0	0	0	0
Limited value Yearlong	77,005	3,134	4	7,952	10	11,086	14

* Includes federal surface and/or mineral ownership.

TABLE 4.7-3
IMPACTS TO MULE DEER POPULATIONS IN THE NORTHEAST MANTI HERD UNIT

Alternative	Percent Critical Winter Range Affected		Herd Unit Population Cap	Herd Unit Population With Project	Buck Harvest Cap	Buck Harvest With Project
	Project Area	Herd Unit				
Proposed Action - 160-acre Spacing	19	18	14,000	11,480	1,400	1,148
Alternative A - 80-acre Spacing	24	23	14,000	10,780	1,400	1,078
Alternative B1 - Critical Areas Avoidance - 160-acre Spacing	9	8	14,000	12,880	1,400	1,288
Alternative B2 - Critical Areas Avoidance - 80-acre Spacing	12	11	14,000	12,460	1,400	1,246
Alternative C1 - Security Areas Avoidance - 160-acre Spacing	17	16	14,000	11,760	1,400	1,176
Alternative C2 - Security Areas Avoidance - 80-acre Spacing	21	20	14,000	11,200	1,400	1,120
No Action Alternative	8	8	14,000	12,800	1,400	1,280

TABLE 4.7-4
ANALYSIS OF DIRECT IMPACTS ON ELK BY ALTERNATIVE

Habitat Type	Total Acres of Habitat Available in Project Area	Acres Affected: Construction: Federal Lands*	Construction: Non-federal Lands	Construction: Total	Operation: Federal Lands*	Operation: Non-federal Lands	Operation: Total
Proposed Action - 160-acre Spacing							
Critical Winter	30,422	373	435	808	224	252	476
High Value Winter	67,760	1,140	511	1,651	677	274	951
Substantial Value Winter	33,804	483	244	727	266	126	392
Limited Value Winter	13,781	8	28	36	5	18	23
Critical Summer	146	0	0	0	0	0	0
Critical Yearlong	276	0	0	0	0	0	0
Alternative A - 80-acre Spacing							
Critical Winter	30,422	479	541	1,020	296	330	626
High Value Winter	67,760	1,527	669	2,196	964	417	1,381
Substantial Value Winter	33,804	679	481	1,160	413	291	704
Limited Value Winter	13,781	20	71	91	13	45	58
Critical Summer	146	0	0	0	0	0	0
Critical Yearlong	276	0	0	0	0	0	0
Alternative B1 - Critical Areas Avoidance - 160-acre Spacing							
Critical Winter	30,422	151	388	539	82	229	311
High Value Winter	67,760	496	478	974	274	291	565
Substantial Value Winter	33,804	483	244	727	279	127	406
Limited Value Winter	13,781	15	22	37	12	11	23
Critical Summer	146	0	0	0	0	0	0
Critical Yearlong	276	0	0	0	0	0	0
Alternative B2 - Critical Areas Avoidance - 80-acre Spacing							
Critical Winter	30,422	191	515	706	109	322	431
High Value Winter	67,760	641	633	1,274	373	398	771
Substantial Value Winter	33,804	670	493	1,163	409	302	711
Limited Value Winter	13,781	20	68	88	13	44	57
Critical Summer	146	0	0	0	0	0	0
Critical Yearlong	276	0	0	0	0	0	0
Alternative C1 - Security Areas Protection - 160-acre Spacing							
Critical Winter	30,422	237	381	618	141	221	362
High Value Winter	67,760	1,037	487	1,524	618	264	882
Substantial Value Winter	33,804	483	244	727	266	126	392
Limited Value Winter	13,781	8	28	36	5	18	23
Critical Summer	146	0	0	0	0	0	0
Critical Yearlong	276	0	0	0	0	0	0
Alternative C2 - Security Areas Protection - 80-acre Spacing							
Critical Winter	30,422	319	468	787	198	284	482
High Value Winter	67,760	1,374	616	1,990	865	382	1,247
Substantial Value Winter	33,804	679	481	1,160	413	290	703
Limited Value Winter	13,781	20	71	91	13	46	59
Critical Summer	146	0	0	0	0	0	0
Critical Yearlong	276	0	0	0	0	0	0
No Action Alternative							
Critical Winter	30,422	56	377	433	21	224	245
High Value Winter	67,760	149	451	600	67	272	339
Substantial Value Winter	33,804	123	210	333	48	109	157
Limited Value Winter	13,781	0	26	26	0	16	16
Critical Summer	146	0	0	0	0	0	0
Critical Yearlong	276	0	0	0	0	0	0

* Includes federal surface and/or mineral ownership. These areas would be mitigated on a 1:1 basis per Environmental Prot

TABLE 4.7-5
ANALYSIS OF INDIRECT IMPACTS ON ELK BY ALTERNATIVE

Habitat Types	Total Acres of Habitat Available In Project Area	Loss of Habitat Value: Federal Lands* Acres	Federal Lands* Percent	Non-Federal Lands Acres	Non-Federal Lands Percent	Total Lands Acres	Total Lands Percent
Proposed Action - 160-acre Spacing							
Critical Winter	30,422	6,338	21	4,477	15	10,815	36
High Value Winter	67,760	26,259	39	11,633	17	37,892	56
Substantial Value Winter	33,804	13,047	39	7,057	21	20,104	59
Limited Value Winter	13,781	368	3	2,362	17	2,730	20
Critical Summer	146	10	7	78	53	88	60
Critical Yearlong	276	0	0	0	0	0	0
Alternative A - 80-acre Spacing							
Critical Winter	30,422	6,368	21	4,460	15	10,828	36
High Value Winter	67,760	26,383	39	12,119	18	38,502	57
Substantial Value Winter	33,804	13,451	40	13,588	40	27,039	80
Limited Value Winter	13,781	416	3	3,473	25	3,889	28
Critical Summer	146	10	7	78	53	88	60
Critical Yearlong	276	0	0	0	0	0	0
Alternative B1 - Critical Areas Avoidance - 160-acre Spacing							
Critical Winter	30,422	5,085	17	4,577	15	9,662	32
High Value Winter	67,760	18,067	27	11,221	17	29,288	43
Substantial Value Winter	33,804	13,337	39	6,653	20	19,990	59
Limited Value Winter	13,781	368	3	2,370	17	2,738	20
Critical Summer	146	10	7	78	53	88	60
Critical Yearlong	276	0	0	0	0	0	0
Alternative B2 - Critical Areas Avoidance - 80-acre Spacing							
Critical Winter	30,422	5,506	18	4,581	15	10,087	33
High Value Winter	67,760	19,148	28	12,222	18	31,370	46
Substantial Value Winter	33,804	13,405	40	13,784	41	27,189	80
Limited Value Winter	13,781	409	3	3,445	25	3,854	28
Critical Summer	146	10	7	78	53	88	60
Critical Yearlong	276	0	0	0	0	0	0
Alternative C1 - Security Areas Protection - 160-acre Spacing							
Critical Winter	30,422	5,293	17	4,076	13	9,369	31
High Value Winter	67,760	26,579	39	11,716	17	38,295	57
Substantial Value Winter	33,804	13,350	39	6,707	20	20,057	59
Limited Value Winter	13,781	368	3	2,362	17	2,730	20
Critical Summer	146	10	7	78	53	88	60
Critical Yearlong	276	0	0	0	0	0	0
Alternative C2 - Security Areas Protection - 80-acre Spacing							
Critical Winter	30,422	5,511	18	4,079	13	9,590	32
High Value Winter	67,760	27,224	40	12,326	18	39,550	58
Substantial Value Winter	33,804	13,459	40	13,716	41	27,175	80
Limited Value Winter	13,781	416	3	3,473	25	3,889	28
Critical Summer	146	10	7	78	53	88	60
Critical Yearlong	276	0	0	0	0	0	0
No Action Alternative							
Critical Winter	30,422	2,386	8	4,106	13	6,492	21
High Value Winter	67,760	10,645	16	10,701	16	21,346	32
Substantial Value Winter	33,804	7,010	21	5,699	17	12,709	38
Limited Value Winter	13,781	139	1	2,293	17	2,432	18
Critical Summer	146	10	7	78	53	88	60
Critical Yearlong	276	0	0	0	0	0	0

* Includes federal surface and/or mineral ownership.

TABLE 4.7-6
IMPACTS TO ELK POPULATIONS IN THE MANTI HERD UNIT

Alternative	Percent Critical Winter Range Affected		Herd Unit Population Cap	Herd Unit Population With Project	Bull Harvest Cap	Bull Harvest With Project
	Project Area	Herd Unit				
Proposed Action - 160-acre Spacing	36	11	11,000	9,790	1,300	1,157
Alternative A - 80-acre Spacing	36	11	11,000	9,790	1,300	1,157
Alternative B1 - Critical Areas Avoidance - 160-acre Spacing	32	10	11,000	9,900	1,300	1,170
Alternative B2 - Critical Areas Avoidance - 80-acre Spacing	33	10	11,000	9,900	1,300	1,170
Alternative C1 - Security Areas Avoidance - 160-acre Spacing	31	9	11,000	10,010	1,300	1,183
Alternative C2 - Security Areas Avoidance - 80-acre Spacing	32	10	11,000	9,900	1,300	1,170
No Action Alternative	21	6	11,000	10,340	1,300	1,222

TABLE 4.7-7
ANALYSIS OF DIRECT IMPACTS ON BEAR BY ALTERNATIVE

Habitat Type	Total Acres of Habitat Available in Project Area	Acres Affected					
		Construction			Operation		
		Federal Lands*	Non-Federal Lands	Total	Federal Lands	Non-Federal Lands	Total
Proposed Action - 160-acre Spacing							
High Value Yearlong	26,578	194	372	566	114	217	331
Alternative A - 80-acre Spacing							
High Value Yearlong	26,578	227	446	673	136	272	408
Alternative B1 - Critical Areas Avoidance - 160-acre Spacing							
High Value Yearlong	26,578	84	346	430	43	205	248
Alternative B2 - Critical Areas Avoidance - 80-acre Spacing							
High Value Yearlong	26,578	89	425	514	46	262	308
Alternative C1 - Security Areas Protection - 160-acre Spacing							
High Value Yearlong	26,578	98	330	428	56	194	250
Alternative C2 - Security Areas Protection - 80-acre Spacing							
High Value Yearlong	26,578	125	386	511	76	234	310
No Action Alternative							
High Value Yearlong	26,578	63	343	406	29	202	231

* Includes federal surface and/or mineral ownership.

TABLE 4.7-8
ANALYSIS OF INDIRECT IMPACTS ON BEAR BY ALTERNATIVE

Habitat Types	Total Acres of Habitat Available In Project Area	Loss of Habitat Value					
		Federal Lands*		Non-Federal Lands		Total Lands	
		Acres	Percent	Acres	Percent	Acres	Percent
Proposed Action - 160-acre Spacing							
High Value Yearlong	26,578	10,084	38	12,246	46	22,330	84
Alternative A - 80-acre Spacing							
High Value Yearlong	26,578	10,086	38	12,265	46	22,351	84
Alternative B1 - Critical Areas Avoidance - 160-acre Spacing							
High Value Yearlong	26,578	5,659	21	12,045	45	17,704	67
Alternative B2 - Critical Areas Avoidance - 80-acre Spacing							
High Value Yearlong	26,578	6,300	24	12,244	46	18,544	70
Alternative C1 - Security Areas Protection - 160-acre Spacing							
High Value Yearlong	26,578	6,032	23	11,364	43	17,396	65
Alternative C2 - Security Areas Protection - 80-acre Spacing							
High Value Yearlong	26,578	6,245	23	11,401	43	17,646	66
No Action Alternative							
High Value Yearlong	26,578	5,380	20	11,827	44	17,207	65

* Includes federal surface and/or mineral ownership.

TABLE 4.7-9
ANALYSIS OF DIRECT IMPACTS ON ANTELOPE BY ALTERNATIVE

Habitat Type	Total Acres of Habitat Available in Project Area	Acres Affected					
		Construction			Operation		
		Federal Lands*	Non-Federal Lands	Total	Federal Lands	Non-Federal Lands	Total
Proposed Action - 160-acre Spacing							
High Value Yearlong	49,142	415	456	871	243	268	511
Potential Yearlong	28,913	403	246	649	223	126	349
Alternative A - 80-acre Spacing							
High Value Yearlong	49,142	613	663	1,276	390	412	802
Potential Yearlong	28,913	586	498	1,084	357	298	655
Alternative B1 - Critical Areas Avoidance - 160-acre Spacing							
High Value Yearlong	49,142	415	456	871	247	268	515
Potential Yearlong	28,913	403	247	650	233	127	360
Alternative B2 - Critical Areas Avoidance - 80-acre Spacing							
High Value Yearlong	49,142	745	528	1,273	521	279	800
Potential Yearlong	28,913	571	513	1,084	350	311	661
Alternative C1 - Security Areas Protection - 160-acre Spacing							
High Value Yearlong	49,142	415	456	871	243	268	511
Potential Yearlong	28,913	403	246	649	223	126	349
Alternative C2 - Security Areas Protection - 80-acre Spacing							
High Value Yearlong	49,142	613	663	1,276	390	412	802
Potential Yearlong	28,913	586	497	1,083	357	299	656
No Action Alternative							
High Value Yearlong	49,142	115	401	516	53	241	294
Potential Yearlong	28,913	98	209	307	36	107	143

* Includes federal surface and mineral ownership.

TABLE 4.7-10
ANALYSIS OF INDIRECT IMPACTS ON ANTELOPE BY ALTERNATIVE

Habitat Types	Total Acres of Habitat Available In Project Area	Loss of Habitat Value					
		Federal Lands*		Non-Federal Lands		Total Lands	
		Acres	Percent	Acres	Percent	Acres	Percent
Proposed Action - 160-acre Spacing							
High Value Yearlong	49,142	2,902	6	3,186	6	6,088	12
Potential Yearlong	28,913	2,630	9	1,378	5	4,008	14
Alternative A - 80-acre Spacing							
High Value Yearlong	49,142	3,926	8	4,358	9	8,284	17
Potential Yearlong	28,913	3,754	13	2,987	10	6,741	23
Alternative B1 - Critical Areas Avoidance - 160-acre Spacing							
High Value Yearlong	49,142	2,902	6	3,186	6	6,088	12
Potential Yearlong	28,913	2,628	9	1,388	5	4,016	14
Alternative B2 - Critical Areas Avoidance - 80-acre Spacing							
High Value Yearlong -	49,142	3,921	8	4,345	9	8,266	17
Potential Yearlong	28,913	3,555	12	3,098	11	6,653	23
Alternative C1 - Security Areas Protection - 160-acre Spacing							
High Value Yearlong	49,142	2,902	6	3,186	6	6,088	12
Potential Yearlong	28,913	2,630	9	1,378	5	4,008	14
Alternative C2 - Security Areas Protection - 80-acre Spacing							
High Value Yearlong	49,142	3,926	8	4,358	9	8,284	17
Potential Yearlong	28,913	3,754	13	2,987	10	6,741	23
No Action Alternative							
High Value Yearlong	49,142	889	2	2,249	5	3,138	6
Potential Yearlong	28,913	603	2	980	3	1,583	5

* Includes federal surface and/or mineral ownership.

TABLE 4.7-11
ANALYSIS OF DIRECT IMPACTS ON MOOSE BY ALTERNATIVE

Habitat Type	Total Acres in Project	Acres Affected					
		Construction			Operation		
		Federal Lands*	Non-Federal Lands	Total	Federal Lands	Non-Federal Lands	Total
Proposed Action - 160-acre Spacing							
Low Value Winter	20,198	119	237	356	74	139	213
Alternative A - 80-acre Spacing							
Low Value Winter	20,198	129	278	407	81	169	250
Alternative B1 - Critical Areas Avoidance - 160-acre Spacing							
Low Value Winter	20,198	74	223	297	43	133	176
Alternative B2 - Critical Areas Avoidance - 80-acre Spacing							
Low Value Winter	20,198	79	269	348	46	166	212
Alternative C1 - Security Areas Protection - 160-acre Spacing							
Low Value Winter	20,198	64	195	259	39	117	156
Alternative C2 - Security Areas Protection - 80-acre Spacing							
Low Value Winter	20,198	76	227	303	48	139	187
No Action Alternative							
Low Value Winter	20,198	54	220	274	29	131	160

* Includes federal surface and/or mineral ownership.

TABLE 4.7-12
ANALYSIS OF INDIRECT IMPACTS ON MOOSE BY ALTERNATIVE

Habitat Types	Total Acres of Habitat Available In Project Area	Loss of Habitat Value					
		Federal Lands*		Non-Federal Lands		Total Lands	
		Acres	Percent	Acres	Percent	Acres	Percent
Proposed Action - 160-acre Spacing							
Low Value Winter	20,198	2,663	13	9,546	47	12,209	60
Alternative A - 80-acre Spacing							
Low Value Winter	20,198	2,663	13	9,536	47	12,199	60
Alternative B1 - Critical Areas Avoidance - 160-acre Spacing							
Low Value Winter	20,198	2,178	11	8,965	44	11,143	55
Alternative B2 - Critical Areas Avoidance - 80-acre Spacing							
Low Value Winter	20,198	2,244	11	9,107	45	11,351	56
Alternative C1 - Security Areas Protection - 160-acre Spacing							
Low Value Winter	20,198	1,861	9	7,933	39	9,794	48
Alternative C2 - Security Areas Protection - 80-acre Spacing							
Low Value Winter	20,198	1,918	9	7,962	39	9,880	49
No Action Alternative							
Low Value Winter	20,198	2,027	10	8,817	44	10,844	54

* Includes federal surface and/or mineral ownership.

TABLE 4.7-13
PRICE CBM PROJECT
DIRECT IMPACTS (IN ACRES) TO BIG GAME HABITAT

Alternative/Habitat Type	Federal Lands[1]		Other Lands		Total	
	Construction	Operations	Construction	Operations	Construction	Operations
Proposed Action - 160-acre Spacing						
Big Game Critical Winter Range[2]	1,122	665	777	426	1,899	1,091
Big Game High Priority Range[3]	476	284	180	106	656	390
Total					2,555	1,481
Alternative A - 80-acre Spacing						
Big Game Critical Winter Range[2]	1,500	939	1,009	625	2,509	1,564
Big Game High Priority Range[3]	629	397	226	139	855	536
Total					3,364	2,100
Alternative B1 - Critical Areas Avoidance - 160-acre Spacing						
Big Game Critical Winter Range[2]	263	123	698	418	961	541
Big Game High Priority Range[3]	471	285	177	105	648	390
Total					1,609	931
Alternative B2 - Critical Areas Avoidance - 80-acre Spacing						
Big Game Critical Winter Range[2]	331	163	949	600	1,280	763
Big Game High Priority Range[3]	623	393	225	139	848	532
Total					2,128	1,295
Alternative C1 - Security Areas Protection - 160-acre Spacing						
Big Game Critical Winter Range[2]	884	525	700	384	1,584	909
Big Game High Priority Range[3]	475	284	178	104	653	388
Total					2,237	1,297
Alternative C2 - Security Areas Protection - 80-acre Spacing						
Big Game Critical Winter Range[2]	1,187	741	886	546	2,073	1,287
Big Game High Priority Range[3]	628	396	225	139	853	535
Total					2,926	1,822
No Action						
Big Game Critical Winter Range[2]	148	58	683	408	831	466
Big Game High Priority Range[3]	83	43	153	91	236	134
Total					1,067	600

[1]Includes both federal surface and subsurface ownership. Big game critical winter range on federal lands covers 46,779 acres of the 74,174 total acres of critical winter range. High value winter range on federal land covers 20,551 acres of 33,138 total.

[2]Includes areas where either mule deer and/or elk critical winter range occurs

[3]Includes areas where either mule deer and/or elk high value winter range occurs, unless they are considered to be critical habitat for one of the species.

TABLE 4.8-1

SUMMARY OF BIOLOGICAL ASSESSMENT (BA) FOR ENDANGERED AND THREATENED SPECIES, FOR ALL ALTERNATIVES

Species	BA Conclusion
Bald eagle	Not likely to adversely affect
Barneby reed mustard	No effect
Black-footed ferret	No effect
Bonytail chub	Not likely to adversely affect
Colorado squawfish	Not likely to adversely affect
Humpback chub	Not likely to adversely affect
Jones cycladenia	No effect
Last Chance townsendia	No effect
Maguire daisy	No effect
Peregrine falcon	May adversely affect
Razorback sucker	Not likely to adversely affect
San Rafael cactus	No effect
Wright fishhook cactus	No effect

TABLE 4.8-2

DISTANCE OF BALD EAGLE ROOSTS TO CBM WELLS, ROADS, AND FACILITIES BY ALTERNATIVE

	Roost			
Alternative	Gordon Crk E.	Gordon Crk W.	Bull Point	Miller Creek
Proposed Action - 160-acre Spacing	> 400 m	> 400 m *	< 400 m	> 1600 m
Alternative A - 80-acre Spacing	> 400 m	> 400 m *	< 400 m	> 800 m
Alternative B1 - Critical Areas Avoidance - 160-acre Spacing	> 400 m	> 400 m *	> 400 m	> 1600 m
Alternative B2 - Critical Areas Avoidance - 80-acre Spacing	> 400 m	> 400 m *	> 400 m	> 800 m
Alternative C1 - Security Areas Protection - 160-acre Spacing	>400 m	>400 m	<400 m	>1600 m
Alternative C2 - Security Areas Protection - 80-acre Spacing	>400 m	>400 m	<400 m	>800 m
No Action	> 400 m	> 400 m *	> 400m	> 1600 m

*The nearest disturbance to the Gordon Creek West roost is the existing county road that is between 400 and 800 m from the roost.

TABLE 4.9-1

CULTURAL RESOURCES
ACRES OF GROUND DISTURBANCE

Proposed Action - 160-Acre Well Spacing

Cultural Resource Sensitivity Zones	Acres Affected					Percent of Type in Study Area				
	BLM	UDWR	State	Private	Total	BLM	UDWR	State	Private	Total
High	520	310	211	572	1613	2.1%	3.0%	2.0%	1.4%	1.9%
Medium	1400	23	269	293	1985	2.8%	2.6%	1.8%	1.8%	2.4%
Low	291	0	137	68	496	3.6%	0.0%	1.5%	2.9%	2.5%

Alternative A - 80-Acre Well Spacing

Cultural Resource Sensitivity Zones	Acres Affected					Percent of Type in Study Area				
	BLM	UDWR	State	Private	Total	BLM	UDWR	State	Private	Total
High	722	365	271	751	2109	2.9%	3.6%	2.6%	1.8%	2.4%
Medium	1895	28	413	418	2754	3.8%	3.1%	2.7%	2.6%	3.3%
Low	431	0	349	117	897	5.4%	0.0%	3.7%	5.0%	4.6%

Alternative B1 - Critical Areas Avoidance - 160-Acre Well Spacing

Cultural Resource Sensitivity Zones	Acres Affected					Percent of Type in Study Area				
	BLM	UDWR	State	Private	Total	BLM	UDWR	State	Private	Total
High	221	256	197	542	1216	0.9%	2.5%	1.9%	1.3%	1.4%
Medium	888	6	256	289	1439	1.8%	0.7%	1.7%	1.8%	1.8%
Low	291	0	137	68	496	3.6%	0.0%	1.5%	2.9%	2.5%

Alternative B2 - Critical Areas Avoidance - 80-Acre Well Spacing

Cultural Resource Sensitivity Zones	Acres Affected					Percent of Type in Study Area				
	BLM	UDWR	State	Private	Total	BLM	UDWR	State	Private	Total
High	327	320	261	717	1625	1.3%	3.1%	2.5%	1.7%	1.9%
Medium	1178	10	416	404	2009	2.4%	1.1%	2.7%	2.5%	2.4%
Low	428	0	329	118	875	5.3%	0.0%	3.5%	5.0%	4.4%

TABLE 4.9-1

CULTURAL RESOURCES
ACRES OF GROUND DISTURBANCE

Alternative C1 - Security Area Protection - 160-Acre Well Spacing

Cultural Resource Sensitivity Zones	Acres Affected					Percent of Type in Study Area				
	BLM	UDWR	State	Private	Total	BLM	UDWR	State	Private	Total
High	387	216	225	561	1389	1.6%	2.1%	2.1%	1.4%	1.6%
Medium	1339	14	257	284	1894	2.7%	1.6%	1.7%	1.8%	2.3%
Low	291	0	137	68	496	3.6%	0.0%	1.5%	2.9%	2.5%

Alternative C2 - Security Area Protection - 80-Acre Well Spacing

Cultural Resource Sensitivity Zones	Acres Affected					Percent of Type in Study Area				
	BLM	UDWR	State	Private	Total	BLM	UDWR	State	Private	Total
High	538	264	272	731	1805	2.2%	2.6%	2.6%	1.8%	2.1%
Medium	1805	16	395	400	2616	3.6%	1.8%	2.6%	2.5%	3.2%
Low	431	0	349	117	897	5.4%	0.0%	3.6%	5.0%	4.6%

No Action Alternative

Cultural Resource Sensitivity Zones	Acres Affected					Percent of Type in Study Area				
	BLM	UDWR	State	Private	Total	BLM	UDWR	State	Private	Total
High	83	233	194	488	998	0.3%	2.3%	1.8%	1.2%	1.2%
Medium	199	6	220	253	678	0.4%	0.7%	1.4%	1.6%	0.8%
Low	69	0	113	52	234	0.9%	0.0%	1.2%	2.2%	1.2%

TABLE 4.9-2

CULTURAL RESOURCES
AREA OF POTENTIAL EFFECT FOR VARIOUS CBM FACILITY TYPES

Facility Type and Size	Cultural Resource Sensitivity		
	Low	Medium	High
Production well (200 ft. x 300 ft.)	1.4 acres	10.0 acres	10.0 acres
Compressor facility (510 ft. x 420 ft.)	4.9 acres	10.0 acres	13.4 acres
Evaporation pond (400 ft. x 400 ft.)	3.7 acres	10.0 acres	11.2 acres
Injection well (420 ft. x 810 ft.)	7.8 acres	12.5 acres	18.3 acres

TABLE 4.9-3

CULTURAL RESOURCES
AREA OF POTENTIAL EFFECT (ACRES)

Proposed Action - 160-Acre Spacing				
Facility Type	Low	Medium	High	Total
Production well	91	2960	2400	5451
Compressor facility	4.9	20	26.8	51.7
Evaporation pond	3.7	30	33.6	67.3
Injection well	7.8	37.5	54.9	100.2
Transportation corridors	495.9	3120.8	4971.5	8588.3
Total APE (acres)	603.3	6168.3	7486.8	14258.5
	3.1%	7.5%	8.7%	
Alternative A - 80-Acre Spacing				
Facility Type	Low	Medium	High	Total
Production well	243.6	5310	3970	9523.6
Compressor facility	4.9	20	26.8	51.7
Evaporation pond	7.4	30	33.6	71
Injection well	15.6	37.5	54.9	108
Transportation corridors	834.6	4173.2	6241.6	11249.5
Total APE (acres)	1106.1	9570.7	10326.9	21003.8
	5.6%	11.7%	11.9%	
Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing				
Facility Type	Low	Medium	High	Total
Production well	91	2010	1700	3801
Compressor facility	4.9	20	26.8	51.7
Evaporation pond	3.7	10	33.6	47.3
Injection well	7.8	12.5	54.9	75.2
Transportation corridors	495.9	2268.0	3447.4	6211.4
Total APE (acres)	603.3	4320.5	5262.7	10186.6
	3.1%	5.3%	6.1%	
Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing				
Facility Type	Low	Medium	High	Total
Production well	243.6	3650	2910	6803.6
Compressor facility	4.9	20	26.8	51.7
Evaporation pond	3.7	20	44.8	68.5
Injection well	7.8	25	73.2	106
Transportation corridors	834.6	2993.8	4463.5	8292.0
Total APE (acres)	1094.6	6708.8	7518.3	15321.8
	5.6%	8.2%	8.7%	

TABLE 4.9-3

CULTURAL RESOURCES
AREA OF POTENTIAL AFFECT (ACRES)

Alternative C1 - Security Areas Protection - 160-Acre Spacing				
Facility Type	Low	Medium	High	Total
Production well	91	2780	2070	4941
Compressor facility	4.9	20	26.8	51.7
Evaporation pond	3.7	30	33.6	67.3
Injection well	7.8	37.5	54.9	100.2
Transportation corridors	495.9	2957.5	4028.0	7481.5
Total APE (acres)	603.3	5825.0	6213.3	12641.7
	3.1%	7.1%	7.2%	

Alternative C2 - Security Areas Protection - 80-Acre Spacing				
Facility Type	Low	Medium	High	Total
Production well	243.6	5010	3380	8633.6
Compressor facility	4.9	20	26.8	51.7
Evaporation pond	7.4	30	33.6	71
Injection well	15.6	37.5	54.9	108
Transportation corridors	834.6	3937.3	5153.0	9924.9
Total APE (acres)	1106.1	9034.8	8648.3	18789.2
	5.6%	11.0%	10.0%	

No Action Alternative				
Facility Type	Low	Medium	High	Total
Production well	26.6	800	1300	2126.6
Compressor facility	4.9	20	26.8	51.7
Evaporation pond	3.7	0	33.6	37.3
Injection well	7.8	0	54.9	62.7
Transportation corridors	217.7	1052.4	2939.4	4209.5
Total APE (acres)	260.7	1872.4	4354.7	6487.8
	1.3%	2.3%	5.0%	

TABLE 4.10-1
DIRECT IMPACTS TO LAND USE

Land Use Category	Acres Affected												Percent of Type in Study Area											
	Construction						Operation						Construction						Operation					
	BLM	UDWR	State	Private Only	Private - Split Estate	Total	BLM	UDWR	State	Private Only	Private - Split Estate	Total	BLM	UDWR	State	Private Only	Private - Split Estate	Total	BLM	UDWR	State	Private Only	Private - Split Estate	Total
PROPOSED ACTION - 160-ACRE SPACING																								
Agricultural	1	3	0	179	8	191	0	2	0	111	4	117	2.7	2.2	0.0	1.7	2.6	1.70	0.0	1.4	0.0	1.0	1.5	1.0
Extractive	8	0	4	4	0	16	4	0	1	3	0	8	6.2	0.0	1.2	0.7	0.0	1.4	3.1	0.0	0.3	0.5	0.0	0.7
Industrial	0	0	0	1	0	1	0	0	0	1	0	1	0.0	0.0	0.0	1.9	0.0	1.8	0.0	0.0	0.0	1.9	0.0	1.8
Open Space	2,202	331	613	648	84	3,878	1,291	192	356	339	45	2,223	2.7	3.0	1.8	1.8	1.2	2.3	1.6	1.8	1.0	1.0	0.7	1.3
Rural Residential	0	0	0	3	2	5	0	0	0	2	1	3	0.0	0.0	0.0	0.6	12.2	1.0	0.0	0.0	0.0	0.4	10.6	0.6
Single Family Res.	0	0	0	4	0	4	0	0	0	3	0	3	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.7	0.0	0.7
ALTERNATIVE A - 80-ACRE SPACING																								
Agricultural	1	3	0	270	13	287	1	2	0	177	8	188	2.7	2.2	0.0	2.5	4.5	2.5	2.7	1.4	0.0	1.6	2.8	1.7
Extractive	8	0	4	4	2	18	4	0	2	2	2	10	6.2	0.0	1.2	0.7	0.0	1.6	3.1	0.0	0.6	0.4	0.0	0.9
Industrial	0	0	0	1	0	1	0	0	0	1	0	1	0.0	0.0	0.0	1.9	0.0	1.8	0.0	0.0	0.0	1.9	0.0	1.8
Open Space	3,000	390	994	846	126	5,356	1,897	235	653	512	76	3,373	3.7	3.6	2.9	2.4	1.8	3.2	2.3	2.1	1.9	1.5	1.1	2.0
Rural Residential	0	0	0	4	2	6	0	0	0	3	1	4	0.0	0.0	0.0	0.0	12.2	1.2	0.0	0.0	0.0	0.6	10.6	0.8
Single Family Res.	0	0	0	7	0	7	0	0	0	5	0	5	0.0	0.0	0.0	1.7	0.0	1.7	0.0	0.0	0.0	1.2	0.0	1.2
ALTERNATIVE B1 - CRITICAL AREAS AVOIDANCE - 160-ACRE SPACING																								
Agricultural	1	3	0	179	8	191	0	2	0	111	4	117	2.7	2.2	0.0	1.7	2.6	1.7	0.0	1.4	0.0	1.0	1.4	1.0
Extractive	1	0	4	4	0	9	0	0	1	3	0	4	0.8	0.0	1.2	0.7	0.0	0.8	0.0	0.0	0.3	0.5	0.0	0.4
Industrial	0	0	0	1	0	1	0	0	0	1	0	1	0.0	0.0	0.0	1.9	0.0	1.8	0.0	0.0	0.0	1.9	0.0	1.8
Open Space	1,398	259	585	618	79	2,939	803	148	341	356	43	1,691	1.7	2.4	1.7	1.8	1.1	1.7	1.0	1.3	1.0	1.0	0.6	1.0
Rural Residential	0	0	0	3	2	5	0	0	0	2	1	3	0.0	0.0	0.0	0.6	12.2	1.0	0.0	0.0	0.0	0.4	10.6	0.6
Single Family Res.	0	0	0	4	0	4	0	0	0	3	0	3	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.7	0.0	0.7

TABLE 4.10-1
DIRECT IMPACTS TO LAND USE

Land Use Category	Acres Affected												Percent of Type in Study Area											
	Construction						Operation						Construction						Operation					
	BLM	UDWR	State	Private Only	Private - Split Estate	Total	BLM	UDWR	State	Private Only	Private - Split Estate	Total	BLM	UDWR	State	Private Only	Private - Split Estate	Total	BLM	UDWR	State	Private Only	Private - Split Estate	Total
ALTERNATIVE B2 - CRITICAL AREAS AVOIDANCE - 80-ACRE SPACING																								
Agricultural	1	3	0	270	13	287	1	2	0	176	8	187	2.7	2.2	0.0	2.5	4.4	2.5	2.7	1.4	0.0	1.6	2.8	1.7
Extractive	1	0	6	5	2	14	0	0	2	3	2	7	0.8	0.0	1.7	0.9	0.0	1.3	0.0	0.0	0.6	0.5	0.0	0.6
Industrial	0	0	0	1	0	1	0	0	0	1	0	1	0.0	0.0	0.0	1.9	0.0	1.8	0.0	0.0	0.0	1.9	0.0	1.8
Open Space	1,930	327	1,000	823	114	4,194	1,172	199	631	499	67	2,568	2.3	3.0	2.9	2.3	1.7	2.5	1.4	1.8	1.8	1.4	1.0	1.5
Rural Residential	0	0	0	4	2	6	0	0	0	3	1	4	0.0	0.0	0.0	0.8	12.2	1.2	0.0	0.0	0.0	0.6	10.6	0.8
Single Family Res.	0	0	0	7	0	7	0	0	0	5	0	5	0.0	0.0	0.0	1.7	0.0	1.7	0.0	0.0	0.0	1.2	0.0	1.2
ALTERNATIVE C1 - SECURITY AREAS PROTECTION - 160-ACRE SPACING																								
Agricultural	1	0	0	180	7	188	0	0	0	111	4	115	2.7	0.0	0.0	1.7	2.5	1.7	0.0	0.0	0.0	1.0	1.4	1.0
Extractive	8	0	4	4	0	16	4	0	1	3	0	8	6.2	0.0	1.2	0.7	0.0	1.4	3.1	0.0	0.3	0.5	0.0	0.7
Industrial	0	0	0	1	0	1	0	0	0	1	0	1	0.0	0.0	0.0	1.9	0.0	1.8	0.0	0.0	0.0	1.9	0.0	1.8
Open Space	2,008	230	615	628	84	3,565	1,178	128	360	332	45	2,043	2.4	2.1	1.8	1.8	1.2	2.1	1.4	1.2	1.0	0.9	0.7	1.2
Rural Residential	0	0	0	3	2	5	0	0	0	2	1	3	0.0	0.0	0.0	0.6	12.2	1.0	0.0	0.0	0.0	0.4	10.6	0.6
Single Family Res.	0	0	0	4	0	4	0	0	0	3	0	3	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.7	0.0	0.7
ALTERNATIVE C2 - SECURITY AREAS PROTECTION - 80-ACRE SPACING																								
Agricultural	1	0	0	270	13	284	1	0	0	177	8	186	2.7	0.0	0.0	2.5	4.5	2.5	2.7	0.0	0.0	1.6	2.8	1.6
Extractive	8	0	4	4	2	18	4	0	2	2	2	10	6.2	0.0	1.2	0.7	0.0	1.6	3.1	0.0	0.6	0.4	0.0	0.9
Industrial	0	0	0	1	0	1	0	0	0	1	0	1	0.0	0.0	0.0	1.9	0.0	1.8	0.0	0.0	0.0	1.9	0.0	1.8
Open Space	2,727	280	977	807	126	4,917	1,721	165	758	377	76	3,097	3.3	2.6	2.8	2.3	1.8	2.9	2.1	1.5	2.2	1.1	1.1	1.8
Rural Residential	0	0	0	4	2	6	0	0	0	3	1	4	0.0	0.0	0.0	0.8	12.2	1.2	0.0	0.0	0.0	0.6	10.6	0.8
Single Family Res.	0	0	0	7	0	7	0	0	0	5	0	5	0.0	0.0	0.0	1.7	0.0	1.7	0.0	0.0	0.0	1.2	0.0	1.2
NO ACTION ALTERNATIVE																								
Agricultural	0	3	0	162	4	169	0	2	0	102	3	107	0.0	2.2	0.0	1.5	1.2	1.5	0.0	1.4	0.0	0.9	1.0	1.0
Extractive	0	0	3	3	0	6	0	0	1	2	0	3	0.0	0.0	0.9	0.5	0.0	0.5	0.0	0.0	0.3	0.4	0.0	0.3
Industrial	0	0	0	1	0	1	0	0	0	1	0	1	0.0	0.0	0.0	1.9	0.0	1.8	0.0	0.0	0.0	1.9	0.0	1.8
Open Space	350	236	523	570	46	1,725	143	132	305	333	21	934	0.4	2.2	1.5	1.6	0.7	1.0	0.2	1.2	0.9	0.9	0.3	0.5
Rural Residential	0	0	0	4	0	4	0	0	0	2	0	2	0.0	0.0	0.0	0.8	0.0	0.8	0.0	0.0	0.0	0.4	0.0	0.4
Single Family Res.	0	0	0	4	0	4	0	0	0	3	0	3	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.4	0.0	0.7

TABLE 4.11-1

IMPACTS TO GRAZING ALLOTMENTS [1]
PROPOSED ACTION - 160-ACRE SPACING

Grazing Allotment	Acres per AUM	Acres Affected/AUMs Lost [2]											
		Construction						Operation					
		Public		State/Private		Total		Public		State/Private		Total	
		Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost
Brown	11	9	1	0	0	9	1	6	1	0	0	6	1
Canyon	24	52	2	9	0	61	3	29	1	6	0	35	1
Consumers Wash	15	171	11	50	3	221	15	110	7	29	2	139	9
Fausett	9	2	0	59	7	61	7	2	0	25	3	27	3
Haley Canyon	23	113	5	2	0	115	5	60	3	1	0	61	3
Hiawatha	32	55	2	3	0	58	2	28	1	2	0	30	1
Long Bench	28	14	1	0	0	14	1	9	0	92	3	101	4
Marsing	9	9	1	0	0	9	1	6	1	0	0	6	1
Mathis Wash	11	23	2	0	0	23	2	14	1	0	0	14	1
Miller Creek	11	239	22	67	6	306	28	137	12	33	3	170	15
Mohrland	31	6	0	3	0	9	0	5	0	0	0	5	0
North Huntington	12	152	13	71	6	223	19	93	8	43	4	136	11
North Spring	16	190	12	42	3	232	15	115	7	26	2	141	9
Oviatt	7	11	2	0	0	11	2	7	1	0	0	7	1
Peterson	134	5	0	0	0	5	0	3	0	0	0	3	0
Pinnacle Bench	8	66	8	3	0	69	9	38	5	2	0	40	5
Poison Spring Bench	12	434	36	56	5	490	41	251	21	36	3	287	24
Porphyry Bench	17	203	12	178	10	381	22	118	7	90	5	208	12
Staker	9	32	4	0	0	32	4	18	2	0	0	18	2
Trail Canyon	6	0	0	14	2	14	2	0	0	8	1	8	1
Washboard	25	313	13	95	4	408	16	176	7	58	2	234	9
Wattis	35	25	1	56	2	81	2	15	0	32	1	47	1
Wellington	14	2	0	0	0	2	0	3	0	0	0	3	0
Total for All Allotments		2,126	146	708	48	2,834	195	1,243	86	483	30	1,726	116

[1] Only grazing allotments which are impacted by the alternative are listed in table.

[2] Acres required to produce one AUM was calculated and listed in Table 3.11-1. AUMs lost is calculated by dividing the acres impacted by Acres per AUM for each allotment. Total AUMs lost are rounded to nearest whole number.

[3] Numbers in total column reflect decimal points not shown in other rows of numbers.

TABLE 4.10-1
DIRECT IMPACTS TO LAND USE

Land Use Category	Acres Affected												Percent of Type in Study Area											
	Construction						Operation						Construction						Operation					
	BLM	UDWR	State	Private Only	Private - Split Estate	Total	BLM	UDWR	State	Private Only	Private - Split Estate	Total	BLM	UDWR	State	Private Only	Private - Split Estate	Total	BLM	UDWR	State	Private Only	Private - Split Estate	Total
ALTERNATIVE B2 - CRITICAL AREAS AVOIDANCE - 80-ACRE SPACING																								
Agricultural	1	3	0	270	13	287	1	2	0	176	8	187	2.7	2.2	0.0	2.5	4.4	2.5	2.7	1.4	0.0	1.6	2.8	1.7
Extractive	1	0	6	5	2	14	0	0	2	3	2	7	0.8	0.0	1.7	0.9	0.0	1.3	0.0	0.0	0.6	0.5	0.0	0.6
Industrial	0	0	0	1	0	1	0	0	0	1	0	1	0.0	0.0	0.0	1.9	0.0	1.8	0.0	0.0	0.0	1.9	0.0	1.8
Open Space	1,930	327	1,000	823	114	4,194	1,172	199	631	499	67	2,568	2.3	3.0	2.9	2.3	1.7	2.5	1.4	1.8	1.8	1.4	1.0	1.5
Rural Residential	0	0	0	4	2	6	0	0	0	3	1	4	0.0	0.0	0.0	0.8	12.2	1.2	0.0	0.0	0.0	0.6	10.6	0.8
Single Family Res.	0	0	0	7	0	7	0	0	0	5	0	5	0.0	0.0	0.0	1.7	0.0	1.7	0.0	0.0	0.0	1.2	0.0	1.2
ALTERNATIVE C1 - SECURITY AREAS PROTECTION - 160-ACRE SPACING																								
Agricultural	1	0	0	180	7	188	0	0	0	111	4	115	2.7	0.0	0.0	1.7	2.5	1.7	0.0	0.0	0.0	1.0	1.4	1.0
Extractive	8	0	4	4	0	16	4	0	1	3	0	8	6.2	0.0	1.2	0.7	0.0	1.4	3.1	0.0	0.3	0.5	0.0	0.7
Industrial	0	0	0	1	0	1	0	0	0	1	0	1	0.0	0.0	0.0	1.9	0.0	1.8	0.0	0.0	0.0	1.9	0.0	1.8
Open Space	2,008	230	615	628	84	3,565	1,178	128	360	332	45	2,043	2.4	2.1	1.8	1.8	1.2	2.1	1.4	1.2	1.0	0.9	0.7	1.2
Rural Residential	0	0	0	3	2	5	0	0	0	2	1	3	0.0	0.0	0.0	0.6	12.2	1.0	0.0	0.0	0.0	0.4	10.6	0.6
Single Family Res.	0	0	0	4	0	4	0	0	0	3	0	3	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.7	0.0	0.7
ALTERNATIVE C2 - SECURITY AREAS PROTECTION - 80-ACRE SPACING																								
Agricultural	1	0	0	270	13	284	1	0	0	177	8	186	2.7	0.0	0.0	2.5	4.5	2.5	2.7	0.0	0.0	1.6	2.8	1.6
Extractive	8	0	4	4	2	18	4	0	2	2	2	10	6.2	0.0	1.2	0.7	0.0	1.6	3.1	0.0	0.6	0.4	0.0	0.9
Industrial	0	0	0	1	0	1	0	0	0	1	0	1	0.0	0.0	0.0	1.9	0.0	1.8	0.0	0.0	0.0	1.9	0.0	1.8
Open Space	2,727	280	977	807	126	4,917	1,721	165	758	377	76	3,097	3.3	2.6	2.8	2.3	1.8	2.9	2.1	1.5	2.2	1.1	1.1	1.8
Rural Residential	0	0	0	4	2	6	0	0	0	3	1	4	0.0	0.0	0.0	0.8	12.2	1.2	0.0	0.0	0.0	0.6	10.6	0.8
Single Family Res.	0	0	0	7	0	7	0	0	0	5	0	5	0.0	0.0	0.0	1.7	0.0	1.7	0.0	0.0	0.0	1.2	0.0	1.2
NO ACTION ALTERNATIVE																								
Agricultural	0	3	0	162	4	169	0	2	0	102	3	107	0.0	2.2	0.0	1.5	1.2	1.5	0.0	1.4	0.0	0.9	1.0	1.0
Extractive	0	0	3	3	0	6	0	0	1	2	0	3	0.0	0.0	0.9	0.5	0.0	0.5	0.0	0.0	0.3	0.4	0.0	0.3
Industrial	0	0	0	1	0	1	0	0	0	1	0	1	0.0	0.0	0.0	1.9	0.0	1.8	0.0	0.0	0.0	1.9	0.0	1.8
Open Space	350	236	523	570	46	1,725	143	132	305	333	21	934	0.4	2.2	1.5	1.6	0.7	1.0	0.2	1.2	0.9	0.9	0.3	0.5
Rural Residential	0	0	0	4	0	4	0	0	0	2	0	2	0.0	0.0	0.0	0.8	0.0	0.8	0.0	0.0	0.0	0.4	0.0	0.4
Single Family Res.	0	0	0	4	0	4	0	0	0	3	0	3	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.4	0.0	0.7

TABLE 4.11-1

IMPACTS TO GRAZING ALLOTMENTS [1]

PROPOSED ACTION - 160-ACRE SPACING

Grazing Allotment	Acres per AUM	Acres Affected/AUMs Lost [2]											
		Construction						Operation					
		Public		State/Private		Total		Public		State/Private		Total	
		Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost
Brown	11	9	1	0	0	9	1	6	1	0	0	6	1
Canyon	24	52	2	9	0	61	3	29	1	6	0	35	1
Consumers Wash	15	171	11	50	3	221	15	110	7	29	2	139	9
Fausett	9	2	0	59	7	61	7	2	0	25	3	27	3
Haley Canyon	23	113	5	2	0	115	5	60	3	1	0	61	3
Hiawatha	32	55	2	3	0	58	2	28	1	2	0	30	1
Long Bench	28	14	1	0	0	14	1	9	0	92	3	101	4
Marsing	9	9	1	0	0	9	1	6	1	0	0	6	1
Mathis Wash	11	23	2	0	0	23	2	14	1	0	0	14	1
Miller Creek	11	239	22	67	6	306	28	137	12	33	3	170	15
Mohrland	31	6	0	3	0	9	0	5	0	0	0	5	0
North Huntington	12	152	13	71	6	223	19	93	8	43	4	136	11
North Spring	16	190	12	42	3	232	15	115	7	26	2	141	9
Oviatt	7	11	2	0	0	11	2	7	1	0	0	7	1
Peterson	134	5	0	0	0	5	0	3	0	0	0	3	0
Pinnacle Bench	8	66	8	3	0	69	9	38	5	2	0	40	5
Poison Spring Bench	12	434	36	56	5	490	41	251	21	36	3	287	24
Porphyry Bench	17	203	12	178	10	381	22	118	7	90	5	208	12
Staker	9	32	4	0	0	32	4	18	2	0	0	18	2
Trail Canyon	6	0	0	14	2	14	2	0	0	8	1	8	1
Washboard	25	313	13	95	4	408	16	176	7	58	2	234	9
Wattis	35	25	1	56	2	81	2	15	0	32	1	47	1
Wellington	14	2	0	0	0	2	0	3	0	0	0	3	0
Total for All Allotments		2,126	146	708	48	2,834	195	1,243	86	483	30	1,726	116

[1] Only grazing allotments which are impacted by the alternative are listed in table.

[2] Acres required to produce one AUM was calculated and listed in Table 3.11-1. AUMs lost is calculated by dividing the acres impacted by Acres per AUM for each allotment. Total AUMs lost are rounded to nearest whole number.

[3] Numbers in total column reflect decimal points not shown in other rows of numbers.

TABLE 4.11-1

IMPACTS TO GRAZING ALLOTMENTS [1]

ALTERNATIVE A - 80-ACRE SPACING

Grazing Allotment	Acres per AUM	Acres Affected/AUMs Lost [2]											
		Construction						Operation					
		Public		State/Private		Total		Public		State/Private		Total	
		Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost
Brown	11	9	1	0	0	9	1	6	1	0	0	6	1
Canyon	24	65	3	16	1	81	3	39	2	10	0	49	2
Consumers Wash	15	224	15	64	4	288	19	148	10	39	3	187	12
Fausett	9	4	0	72	8	76	8	3	0	44	5	47	5
Haley Canyon	23	141	6	3	0	144	6	79	3	2	0	81	4
Hiawatha	32	57	2	8	0	65	2	29	1	5	0	34	1
Long Bench	28	21	1	189	7	210	8	14	1	116	4	130	5
Marsing	9	15	2	0	0	15	2	11	1	0	0	11	1
Mathis Wash	11	35	3	0	0	35	3	23	2	0	0	23	2
Miller Creek	11	363	33	140	13	503	46	218	20	85	8	303	28
Mohrland	31	13	0	3	0	16	1	9	0	0	0	9	0
North Huntington	12	196	16	108	9	304	25	123	10	70	6	193	16
North Spring	16	275	17	53	3	328	21	175	11	33	2	208	13
Oviatt	7	14	2	0	0	14	2	9	1	0	0	9	1
Peterson	134	8	0	0	0	8	0	5	0	0	0	5	0
Pinnacle Bench	8	96	12	3	0	99	12	59	7	2	0	61	8
Poison Spring Bench	12	578	48	70	6	648	54	368	31	45	4	413	34
Porphyry Bench	17	284	17	232	14	516	30	187	11	149	9	336	20
Staker	9	41	5	1	0	42	5	25	3	1	0	26	3
Trail Canyon	6	0	0	19	3	19	3	0	0	12	2	12	2
Washboard	25	463	19	113	5	576	23	286	11	72	3	358	14
Wattis	35	28	1	63	2	91	3	18	1	37	1	55	2
Wellington	14	4	0	0	0	4	0	3	0	0	0	3	0
Total for All Allotments		2,934	202	1,157	75	4,091	277	1,837	127	722	47	2,559	174

[1] Only grazing allotments which are impacted by the alternative are listed in table.

[2] Acres required to produce one AUM was calculated and listed in Table 3.11-1. AUMs lost is calculated by dividing the acres impacted by Acres per AUM for each allotment. Total AUMs lost are rounded to nearest whole number.

[3] Numbers in total column reflect decimal points not shown in other rows of numbers.

TABLE 4.11-1

IMPACTS TO GRAZING ALLOTMENTS [1]

ALTERNATIVE B1 - CRITICAL AREAS AVOIDANCE - 160-ACRE SPACING

Grazing Allotment	Acres per AUM	Acres Affected/AUMs Lost [2]											
		Construction						Operation					
		Public		State/Private		Total		Public		State/Private		Total	
		Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost
Brown	11	9	1	0	0	9	1	6	1	0	0	6	1
Canyon	24	50	2	10	0	60	3	27	1	6	0	33	1
Consumers Wash	15	5	0	47	3	52	3	2	0	28	2	30	2
Fausett	9	0	0	54	6	54	6	0	0	32	4	32	4
Haley Canyon	23	15	1	0	0	15	1	0	0	0	0	0	0
Hiawatha	32	17	1	3	0	20	1	5	0	2	0	7	0
Long Bench	28	3	0	139	5	142	5	2	0	82	3	84	3
Marsing	9	9	1	0	0	9	1	6	1	0	0	6	1
Mathis Wash	11	23	2	0	0	23	2	14	1	0	0	14	1
Miller Creek	11	230	21	67	6	297	27	131	12	33	3	164	15
Mohrland	31	6	0	3	0	9	0	5	0	0	0	5	0
North Huntington	12	142	12	88	7	230	19	86	7	43	4	129	11
North Spring	16	39	2	37	2	76	5	20	1	23	1	43	3
Oviatt	7	11	2	0	0	11	2	7	1	0	0	7	1
Peterson	134	5	0	0	0	5	0	3	0	0	0	3	0
Pinnacle Bench	8	5	1	1	0	6	1	0	0	0	0	0	0
Poison Spring Bench	12	434	36	56	5	490	41	266	22	36	3	302	25
Porphyry Bench	17	33	2	162	10	195	11	15	1	103	6	118	7
Staker	9	32	4	0	0	32	4	18	2	0	0	18	2
Trail Canyon	6	0	0	14	2	14	2	0	0	8	1	8	1
Washboard	25	314	13	94	4	408	16	180	7	58	2	238	10
Wattis	35	7	0	52	1	59	2	4	0	31	1	35	1
Wellington	14	4	0	0	0	4	0	3	0	0	0	3	0
Total for All Allotments		1,393	100	827	52	2,220	152	800	58	485	30	1,285	88

[1] Only grazing allotments which are impacted by the alternative are listed in table.

[2] Acres required to produce one AUM was calculated and listed in Table 3.11-1. AUMs lost is calculated by dividing the acres impacted by Acres per AUM for each allotment. Total AUMs lost are rounded to nearest whole number.

[3] Numbers in total column reflect decimal points not shown in other rows of numbers.

TABLE 4.11-1

IMPACTS TO GRAZING ALLOTMENTS [1]

ALTERNATIVE B2 - CRITICAL AREAS AVOIDANCE - 80-ACRE SPACING

Grazing Allotment	Acres per AUM	Acres Affected/AUMs Lost [2]											
		Construction						Operation					
		Public		State/Private		Total		Public		State/Private		Total	
		Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost
Brown	11	9	1	0	0	9	1	6	1	0	0	6	1
Canyon	24	62	3	15	1	77	3	37	2	10	0	47	2
Consumers Wash	15	5	0	62	4	67	4	2	0	38	3	40	3
Fausett	9	0	0	65	7	65	7	0	0	43	5	43	5
Haley Canyon	23	18	1	1	0	19	1	1	0	1	0	2	0
Hiawatha	32	17	1	8	0	25	1	5	0	5	0	10	0
Long Bench	28	3	0	176	6	179	6	2	0	109	4	111	4
Marsing	9	15	2	0	0	15	2	11	1	0	0	11	1
Mathis Wash	11	35	3	0	0	35	3	23	2	0	0	23	2
Miller Creek	11	341	31	120	11	461	42	205	19	69	6	274	25
Mohrland	31	13	0	3	0	16	1	9	0	0	0	9	0
North Huntington	12	185	15	108	9	293	24	117	10	70	6	187	16
North Spring	16	40	3	48	3	88	6	20	1	31	2	51	3
Oviatt	7	14	2	0	0	14	2	9	1	0	0	9	1
Peterson	134	8	0	0	0	8	0	5	0	0	0	5	0
Pinnacle Bench	8	21	3	1	0	22	3	8	1	0	0	8	1
Poison Spring Bench	12	578	48	70	6	648	54	368	31	45	4	413	34
Porphyry Bench	17	43	3	212	12	255	15	20	1	138	8	158	9
Staker	9	41	5	0	0	41	5	25	3	1	0	26	3
Trail Canyon	6	0	0	19	3	19	3	12	2	0	0	12	2
Washboard	25	461	18	113	5	574	23	285	11	72	3	357	14
Wattis	35	7	0	59	2	66	2	4	0	36	1	40	1
Wellington	14	4	0	0	0	4	0	3	0	0	0	3	0
Total for All Allotments		1,920	138	1,080	69	3,000	208	1,177	86	668	42	1,845	128

[1] Only grazing allotments which are impacted by the alternative are listed in table.

[2] Acres required to produce one AUM was calculated and listed in Table 3.11-1. AUMs lost is calculated by dividing the acres impacted by Acres per AUM for each allotment. Total AUMs lost are rounded to nearest whole number.

[3] Numbers in total column reflect decimal points not shown in other rows of numbers.

TABLE 4.11-1

IMPACTS TO GRAZING ALLOTMENTS [1]

ALTERNATIVE C1 - SECURITY AREAS PROTECTION - 160-ACRE SPACING

Grazing Allotment	Acres per AUM	Acres Affected/AUMs Lost [2]											
		Construction						Operation					
		Public		State/Private		Total		Public		State/Private		Total	
		Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost
Brown	11	9	1	0	0	9	1	6	1	0	0	6	1
Canyon	24	52	2	10	0	62	3	29	1	6	0	35	1
Consumers Wash	15	141	9	40	3	181	12	92	6	22	1	114	8
Fausett	9	2	0	51	6	53	6	1	0	22	2	23	3
Haley Canyon	23	55	2	2	0	57	2	26	1	1	0	27	1
Hiawatha	32	55	2	3	0	58	2	28	1	2	0	30	1
Long Bench	28	18	1	170	6	188	7	11	0	104	4	115	4
Marsing	9	9	1	0	0	9	1	6	1	0	0	6	1
Mathis Wash	11	23	2	0	0	23	2	14	1	0	0	14	1
Miller Creek	11	239	22	67	6	306	28	137	12	33	3	170	15
Mohrland	31	6	0	3	0	9	0	5	0	0	0	5	0
North Huntington	12	152	13	71	6	223	19	93	8	43	4	136	11
North Spring	16	169	11	29	2	198	12	100	6	18	1	118	7
Oviatt	7	11	2	0	0	11	2	7	1	0	0	7	1
Peterson	134	5	0	0	0	5	0	3	0	0	0	3	0
Pinnacle Bench	8	37	5	3	0	40	5	20	3	2	0	22	3
Poison Spring Bench	12	434	36	56	5	490	41	251	21	36	3	287	24
Porphyry Bench	17	186	11	179	11	365	21	117	7	90	5	207	12
Staker	9	32	4	0	0	32	4	18	2	0	0	18	2
Trail Canyon	6	14	2	0	0	14	2	0	0	8	1	8	1
Washboard	25	314	13	94	4	408	16	176	7	58	2	234	9
Wattis	35	27	1	59	2	86	2	16	0	35	1	51	1
Wellington	14	4	0	0	0	4	0	3	0	0	0	3	0
Total for All Allotments		1,994	138	837	50	2,831	188	1,159	80	480	29	1,639	109

[1] Only grazing allotments which are impacted by the alternative are listed in table.

[2] Acres required to produce one AUM was calculated and listed in Table 3.11-1. AUMs lost is calculated by dividing the acres impacted by Acres per AUM for each allotment. Total AUMs lost are rounded to nearest whole number.

[3] Numbers in total column reflect decimal points not shown in other rows of numbers.

TABLE 4.11-1

IMPACTS TO GRAZING ALLOTMENTS [1]

ALTERNATIVE C2 - SECURITY AREAS PROTECTION - 80-ACRE SPACING

Grazing Allotment	Acres per AUM	Acres Affected/AUMs Lost [2]											
		Construction						Operation					
		Public		State/Private		Total		Public		State/Private		Total	
		Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost
Brown	11	9	1	0	0	9	1	6	1	0	0	6	1
Canyon	24	65	3	16	1	81	3	39	2	10	0	49	2
Consumers Wash	15	180	12	52	3	232	15	120	8	31	2	151	10
Fausett	9	2	0	61	7	63	7	1	0	37	4	38	4
Haley Canyon	23	76	3	3	0	79	3	38	2	2	0	40	2
Hiawatha	32	57	2	8	0	65	2	29	1	5	0	34	1
Long Bench	28	25	1	190	7	215	8	16	1	116	4	132	5
Marsing	9	15	2	0	0	15	2	11	1	0	0	11	1
Mathis Wash	11	35	3	0	0	35	3	23	2	0	0	23	2
Miller Creek	11	363	33	140	13	503	46	218	20	85	8	303	28
Mohrland	31	13	0	3	0	16	1	9	0	0	0	9	0
North Huntington	12	196	16	108	9	304	25	123	10	70	6	193	16
North Spring	16	245	15	34	2	279	17	155	10	21	1	176	11
Oviatt	7	14	2	0	0	14	2	9	1	0	0	9	1
Peterson	134	8	0	0	0	8	0	5	0	0	0	5	0
Pinnacle Bench	8	57	7	3	0	60	8	34	4	2	0	36	5
Poison Spring Bench	12	578	48	70	6	648	54	368	31	45	4	413	34
Porphyry Bench	17	253	15	219	13	472	28	166	10	141	8	307	18
Staker	9	41	5	0	0	41	5	25	3	1	0	26	3
Trail Canyon	6	19	3	0	0	19	3	0	0	12	2	12	2
Washboard	25	463	19	113	5	576	23	286	11	72	3	358	14
Wattis	35	30	1	66	2	96	3	19	1	39	1	58	2
Wellington	14	4	0	0	0	4	0	3	0	0	0	3	0
Total for All Allotments		2,748	191	1,086	68	3,834	259	1,703	118	689	44	2,392	162

[1] Only grazing allotments which are impacted by the alternative are listed in table.

[2] Acres required to produce one AUM was calculated and listed in Table 3.11-1. AUMs lost is calculated by dividing the acres impacted by Acres per AUM for each allotment. Total AUMs lost are rounded to nearest whole number.

[3] Numbers in total column reflect decimal points not shown in other rows of numbers.

TABLE 4.11-1

IMPACTS TO GRAZING ALLOTMENTS [1]
NO ACTION ALTERNATIVE

Grazing Allotment	Acres per AUM	Acres Affected/AUMs Lost [2]											
		Construction						Operation					
		Public		State/Private		Total		Public		State/Private		Total	
		Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost
Brown	11	0	0	0	0	0	0	0	0	0	0	0	0
Canyon	24	17	1	14	1	31	1	9	0	3	0	12	1
Consumers Wash	15	5	0	46	3	51	3	2	0	27	2	29	2
Fausett	9	0	0	53	6	53	6	0	0	32	4	32	4
Haley Canyon	23	15	1	0	0	15	1	0	0	0	0	0	0
Hiawatha	32	5	0	3	0	8	0	0	0	2	0	2	0
Long Bench	28	3	0	139	5	142	5	2	0	82	3	84	3
Marsing	9	0	0	0	0	0	0	0	0	0	0	0	0
Mathis Wash	11	21	2	0	0	21	2	13	1	0	0	13	1
Miller Creek	11	67	6	50	5	117	11	23	2	24	2	47	4
Mohrland	31	0	0	0	0	0	0	0	0	0	0	0	0
North Huntington	12	18	2	57	5	75	6	7	1	36	3	43	4
North Spring	16	26	2	35	2	61	4	14	1	22	1	36	2
Oviatt	7	2	0	0	0	2	0	1	0	0	0	1	0
Peterson	134	0	0	0	0	0	0	0	0	0	0	0	0
Pinnacle Bench	8	5	1	1	0	6	1	0	0	0	0	0	0
Poison Spring Bench	12	44	4	32	3	76	6	25	2	22	2	47	4
Porphyry Bench	17	33	2	162	10	195	11	15	1	103	6	118	7
Staker	9	19	2	0	0	19	2	8	1	0	0	8	1
Trail Canyon	6	14	2	0	0	14	2	0	0	8	1	8	1
Washboard	25	60	2	69	3	129	5	0	0	45	2	45	2
Wattis	35	5	0	48	1	53	2	2	0	27	1	29	1
Wellington	14	0	0	0	0	0	0	0	0	0	0	0	0
Total for All Allotments		359	27	709	43	1,068	69	121	9	433	27	554	36

[1] Only grazing allotments which are impacted by the alternative are listed in table.

[2] Acres required to produce one AUM was calculated and listed in Table 3.11-1. AUMs lost is calculated by dividing the acres impacted by Acres per AUM for each allotment. Total AUMs lost are rounded to nearest whole number.

[3] Numbers in total column reflect decimal points not shown in other rows of numbers.

TABLE 4.13-1
KEY OBSERVATION POINTS EVALUATED FOR CBM PROJECT ALTERNATIVES

Key Observation Point	Landscape Character	Distance Zone	Project Facilities	Contrast Rating	Comments
City of Price at Woodhill (Residential and Recreation)	Open panoramic views to project area. VRM Class II/III	Foreground	No facilities	Not applicable	From most parts of the City, the proposed project would not be visible due to intervening trees, structures, roadways, etc. Woodhill is used for many residents for recreation/open space and provides panoramic views to the project area. Ovcrall, visual impacts from Woodhill are considered Moderate and not significant.
		Middleground	Wells, Drilling Rigs Roads, Dust, Trucks	Moderate - line, form Strong - line, form color, texture	
		Background	Roads, Dust	Moderate to weak - line, form, color	
Community of Wellington (Residential)	Semi-open rural agricultural community. VRM Class III	Middleground	Wells	Weak - line, form	From Wellington, several wells would be within one mile. Viewed against the existing roads, utility lines, agricultural fields and associated buildings, the visual contrasts of the project would be weak.
Dispersed Residential Area Along Gordon Creek Rd. (Residential)	Enclosed river valley with agricultural fields, tan canyon slopes	Foreground	Wells, Drilling Rigs Roads, Dust, Trucks	Strong - line, form, texture, color	Project wclls would be within 0.25 mile of homes and roadway. Wells would also be located on ridgeline above creek. Project would create semi-industrial character in this contained agricultural valley setting. Visual impacts would be Significant.
		Middleground	same as above	strong - line, form texture, color	
Pinnacle Bench (Designated Recreation Trail and Dispersed Recreation Area)	Flat to slightly rolling bench with pinyon/juniper, sagebrush, grassland vegetation. VRM Class III and IV	Foreground and Middleground	Compressor Station Evap. Pond, Injection well, Roads, Dust, Trucks, Elec. Substation, Pipelines	Strong - line, form, color, texture	This area is used for a variety of dispersed recreation (e.g. hunting, horsebackriding, target practice) and has recently been designated as part of the County's Trail System. Construction and operation impacts would be Significant due to the proximity and scale of the CBM facilities. Visual qualities important to recreational values would be lost long-term.
		Background	Roads, Dust	Moderate to Strong - color, form,	From the eastern edge of Pinnacle Bench, views to the CBM facilities would be seen from elevated vantage point. Most facilities that would be viewed are already in operation. Impacts considered moderate and not significant.
Consumer Wash Road (Dispersed Recreation and Local Road Travel)	Rolling pinyon/juniper landscape with northerly views to steep escarpment Mottled vegetation patterns. VRM Class III	Foreground	Wells, Roads and Road cuts, Trucks Dust, Drilling Rigs	Strong - line, form, texture, color	This area is used for wildlife viewing and hunting and provides diversity in landforms and vegetation patterns. Pinyon/juniper vegetation could partially screen wells. Strong contrasts would result during construction and if/where wells are sited on hilltops to the south. Strong contrasts also associated with roads and potential road cuts. Impacts considered Significant within Foreground and Moderate within Middleground Distance Zone.
		Middleground	same as above, except wells	Moderate	

TABLE 4.13-1
KEY OBSERVATION POINTS EVALUATED FOR CBM PROJECT ALTERNATIVES

Key Observation Point	Landscape Character	Distance Zone	Project Facilities	Contrast Rating	Comments
Highway 10 (Major Local Thoroughfare)	Homogeneous salt desert provides open visibility along most stretches of highway VRM Class IV (small section VRM Class III)	Foreground to Middleground	Wells, Roads, Trucks Dust, Drilling Rigs	Strong - line, form color, texture	Highway 10 is a major connector between Price and Huntington. Project facilities would be openly visible along roadway stretches creating a strong industrial character in this otherwise homogeneous landscape. Impacts considered Moderate, Not Significant due to short duration of highway viewing and low visual quality of the landscape.
Highway 6 (State Highway)	Variable visual quality/ character consisting of agriculture, desert, rural residential and City of Price landscapes/developments VRM Class II/III	Middleground	Wells, Trucks, Dust	Moderate - form, color, line	State Highway 6 connects between I-70 and Salt Lake City. Intermittent visibility to project wells within middleground distance zone (over 1.0 mile away) may occur. Distant views to wells on bench ridgelines may also occur. Impacts considered Moderate, Not Significant due to short duration of highway views potentially affected and intervening distance and other similar line/form features.

TABLE 4.13-2
SUMMARY COMPARISON OF VISUAL IMPACTS
CBM PROPOSED PROJECT AND ALTERNATIVES

Key Observation Points	Proposed Action - 160-acre Spacing			Alternative A	Alternative B1	Alternative B2	Alternative C1	Alternative C2	
	Distance Zone	Impact	Facilities/Activities	80-acre Spacing	Critical Areas Avoidance 160-acre Spacing	Critical Areas Avoidance 80-acre Spacing	Security Areas Protection 160-acre Spacing	Security Areas Protection 80-acre Spacing	No Action Alternative
RESIDENTIAL									
Communities									
City of Price - Center	MG	Low	Dust, Trucks	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project
Woodhill Open Space	MG/BG	Moderate	Dust, Roads, Trucks	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project
Spring Glen/Carbonville	MG	Low	Wells Dust, Trucks	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project
Community of Elmo	MG	Low	Dust, Trucks	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project
Wellington	BG	Low/None	Dust, Trucks	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project
Dispersed Residential -									
- Gordon Creek Road	FG/MG	Significant	Wells, Roads, Trucks	Greater than Proposed Project	Significant - Less than Proposed Project	Significant - Similar to Proposed Project	Significant - Slightly less than Proposed Project	Significant - Similar to Proposed Project	Significant - Slightly less than Proposed Project
- South and West of Price	FG	Significant	Wells, Roads, Trucks	Greater than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project
- West of Elmo	FG	Significant	Wells, Roads, Trucks	Slightly Greater than Proposed Project	Same as Proposed Project	Slightly Greater than Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project

TABLE 4.13-2
SUMMARY COMPARISON OF VISUAL IMPACTS
CBM PROPOSED PROJECT AND ALTERNATIVES

Key Observation Points	Proposed Action - 160-acre Spacing			Alternative A	Alternative B1 Critical Areas Avoidance	Alternative B2 Critical Areas Avoidance	Alternative C1 Security Areas Protection	Alternative C2 Security Areas Protection	
	Distance Zone	Impact	Facilities/Activities	80-acre Spacing	160-acre Spacing	80-acre Spacing	160-acre Spacing	80-acre Spacing	No Action Alternative
RECREATION									
County Recreation Trails -									
- Pinnacle Creek/Bench	FG	Significant	Compressor Station, Roads	Greater than Proposed Project	Less than Proposed Project	Less than Proposed Project	Similar to Proposed Project	Greater than Proposed Project	Less than Proposed Project
	MG	Significant	Wells, Dust, Trucks	Greater than Proposed Project	Less than Proposed Project	Less than Proposed Project	Similar to Proposed Project	Greater than Proposed Project	Less than Proposed Project
- Kenilworth/Price Trail	BG	Low/None	Dust	Similar to Proposed Project	Similar to Proposed Project	Similar to Proposed Project	Similar to Proposed Project	Similar to Proposed Project	Similar to Proposed Project
Consumer Wash Road	FG	Significant	Wells, Roads, Dust,	Greater than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Same as Proposed Project
	MG	Moderate	Trucks, Road grading	Greater than Proposed Project	Less than Proposed Project	Significant - Less than Proposed Project	Similar to Proposed Project	Greater than Proposed Project	Less than Proposed Project
Gordon Creek Road	FG	Significant	Wells, Dust, Trucks	Greater than Proposed Project	Similar to Proposed Project	Similar to Proposed Project	Similar to Proposed Project	Greater than Proposed Project	Similar to Proposed Project
	MG	Moderate	Roads	Greater than Proposed Project	Less than Proposed Project	Less than Proposed Project	Similar to Proposed Project	Greater than Proposed Project	Less than Proposed Project
Horse Bench	FG	Significant	Wells, Dust, Trucks	Greater than Proposed Project	Moderate - Less than Proposed Project	Moderate - Less than Proposed Project	Similar to Proposed Project	Greater than Proposed Project	Less than Proposed Project
	MG	Moderate	Roads,	Greater than Proposed Project	Moderate - Less than Proposed Project	Moderate - Less than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Less than Proposed Project
County Fairgrounds	FG	Moderate	Dust, Trucks	Greater than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Same as Proposed Project

TABLE 4.13-2
SUMMARY COMPARISON OF VISUAL IMPACTS
CBM PROPOSED PROJECT AND ALTERNATIVES

Key Observation Points	Proposed Action - 160-acre Spacing			Alternative A 80-acre Spacing	Alternative B1 Critical Areas Avoidance 160-acre Spacing	Alternative B2 Critical Areas Avoidance 80-acre Spacing	Alternative C1 Security Areas Protection 160-acre Spacing	Alternative C2 Security Areas Protection 80-acre Spacing	No Action Alternative
	Distance Zone	Impact	Facilities/Activities						
ROADWAYS									
Highway 6	MG/BG	Low-Mod	Dust, Trucks, Wells	Similar to Proposed Project	Same as Proposed Project	Similar to Proposed Project	Same as Proposed Project	Same as Proposed Project	Similar to Proposed Project
Highway 10	FG/MG	Moderate	Dust, Trucks, Wells	Moderate - Greater than Proposed Project	Same as Proposed Project	Moderate - Greater than Proposed Project	Same as Proposed Project	Moderate - Greater than Proposed Project	Less than Proposed Project
Highways 122 and 155	FG/MG	Moderate	Dust, Trucks, Wells	Greater than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Less than Proposed Project

MG = Middleground

TABLE 4.13-3
BLM PRICE RIVER RESOURCE AREA MFP-DESIGNATED VRM CLASSES ON FEDERAL LANDS

	Total in EIS Area	Construction	Operations
Proposed Action			
Class III	17,456	275	161
Class IV	78,775	2,114	1,254
Alternative A			
Class III	17,456	402	251
Class IV	78,775	2,889	1,828
Alternative B1			
Class III	17,456	215	121
Class IV	78,775	1,307	767
Alternative B2			
Class III	17,456	308	186
Class IV	78,775	1,797	1,107
Alternative C1			
Class III	17,456	259	151
Class IV	78,775	1,890	1,122
Alternative C2			
Class III	17,456	372	231
Class IV	78,775	2,606	1,649
No Action			
Class III	17,456	69	24
Class IV	78,775	345	165

Source: BLM Price River Resource Area MFP, 1983.

TABLE 4.13-4
ACRES OF POTENTIAL VRM CLASSES IMPACTED WITHIN THE CBM PROJECT AREA - BASED ON PRESENT-DAY LANDSCAPE QUALITY AND VISUAL SENSITIVITY CONDITIONS

	Total in EIS Area	Construction	Percent of Total	Operation	Percent of Total
Proposed Action - 160-Acre Spacing					
Class II/III[1]					
- Residential	44,978	503	1.1	285	0.6
- Highway	231	1	0.4	0	0.0
- Recreation	31,206	895	2.9	491	1.6
Total Class II/III	76,415	1,399	1.8	776	1.0
Class III[2]	19,175	394	2.1	233	1.2
Class IV[3]	92,654	2,227	2.4	1,344	1.5
Alternative A - 80-Acre Spacing					
Class II/III[1]					
- Residential	44,978	703	1.6	432	1.0
- Highway	231	1	0.4	0	0.0
- Recreation	31,206	1,132	3.6	681	2.2
Total Class II/III	76,415	1,836	2.4	1,113	1.5
Class III[2]	19,175	560	2.9	351	1.8
Class IV[3]	92,654	3,284	3.5	2,118	2.3
Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing					
Class II/III[1]					
- Residential	44,978	497	1.1	286	0.6
- Highway	231	1	0.4	0	0.0
- Recreation	31,206	547	1.8	292	0.9
Total Class II/III	76,415	1,045	1.4	578	0.8
Class III[2]	19,175	330	1.7	193	1.0
Class IV[3]	92,654	1,698	1.8	1,047	1.1
Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing					
Class II/III[1]					
- Residential	44,978	690	1.5	424	0.9
- Highway	231	1	0.4	0	0.0
- Recreation	31,206	669	2.1	384	1.2
Total Class II/III	76,415	1,360	1.8	808	1.1
Class III[2]	19,175	469	2.4	292	1.5
Class IV[3]	92,654	2,602	2.8	1,672	1.8
Alternative C1 - Security Areas Protection - 160-Acre Spacing					
Class II/III[1]					
- Residential	44,978	500	1.1	283	0.6
- Highway	231	1	0.4	0	0.0
- Recreation	31,206	837	2.7	464	1.5
Total Class II/III	76,415	1,338	1.8	747	1.0
Class III[2]	19,175	380	2.0	225	1.2
Class IV[3]	92,654	1,983	2.1	1,197	1.3
Alternative C2 - Security Areas Protection - 80-Acre Spacing					
Class II/III[1]					
- Residential	44,978	698	1.6	428	1.0
- Highway	231	1	0.4	0	0.0
- Recreation	31,206	1,036	3.3	621	2.0
Total Class II/III	76,415	1,735	2.3	1,049	1.4
Class III[2]	19,175	1,016	5.3	817	4.3
Class IV[3]	92,654	2,490	2.7	1,439	1.6

TABLE 4.13-4
ACRES OF POTENTIAL VRM CLASSES IMPACTED WITHIN THE CBM PROJECT AREA - BASED ON PRESENT-DAY LANDSCAPE QUALITY AND VISUAL SENSITIVITY CONDITIONS

	Total in EIS Area	Construction	Percent of Total	Operation	Percent of Total
No Action Alternative					
Class II/III[1]					
- Residential	44,978	392	0.9	224	0.5
- Highway	231	1	0.4	0	0.0
- Recreation	31,206	514	1.6	280	0.9
Total Class II/III	76,415	907	1.2	504	0.7
Class III[2]	19,175	178	0.9	92	0.5
Class IV[3]	92,654	748	0.8	455	0.5

Source: Woodward-Clyde Consultants
Notes:
[1] Includes all roads (federal, state, private) within 0.5 mile of residential areas, recreation trails, and facilities, and State Highway 6/191.
[2] Includes BLM VRM Class III areas, not included in No. 1.
[3] Includes BLM VRM Class IV areas, not included in No. 1.

TABLE 4.14-1
SOUND LEVELS[a] OF VARIOUS
TYPES OF OPERATING CONSTRUCTION EQUIPMENT

Equipment Type	Sound Level at 15 Meters (50 ft) dBA
Chainsaw	90
20-250 ton Crane	88
Backhoe	85
20-30 cu. yd. Pan Loader	87
D7, D8 and D9 Bulldozers	89
Fuel and Lubrication Truck	88
Water Truck	88
Motor Grader	85
Vibrator/Roller	80
Master Mechanic Truck	88
Flat Bed Truck	88
Dump Trucks	88
Flat Bed Trailers	88
Commercial Tractors	80
Concrete Truck	86
Concrete Pumps	82
Front End Loaders	83
Road Scrapers	87
Air Compressor	82
Automobile	80

[a] These values are logarithmic measurements (i.e., every 10 dBA increase in noise level is perceived by the human ear as approximately 2 times the noise level; therefore, the chainsaw is twice as loud as the automobile)

[b] For comparison, sound levels from compressor units housed in an enclosure would be approximately 30 dB. Sound levels from field operations (vehicle traffic, wellhead operation, well workovers and drilling) would be approximately 60 to 90 dB.

Source: Construction Engineering Research Laboratory 1978.

TABLE 4.15-1
ESTIMATED DIRECT PROJECT EMPLOYMENT

Proposed Action - 160-Acre Spacing						
Year	Project Wells	RGC Employees	Local Contractor*	Transient Contractor*	Total Jobs	Net Change in Local Jobs from Present
1996		18	63	83	164	N/A
1997	60	25	63	83	171	7
1998	120	29	63	83	175	11
1999	180	33	63	83	179	15
2000	240	38	63	83	184	20
2001	300	43	63	83	189	25
2002	360	48	63	83	194	30
2003	420	53	63	83	199	35
2004	480	58	63	83	204	40
2005	540	63	63	83	209	45
2006	601	68	63	83	214	50
2007	601	68	30	0	98	17
2008	601	68	30	0	98	17
2009	540	60	30	0	90	9
2010	540	60	30	0	90	9
2011	480	55	30	0	85	4
2012	480	55	30	0	85	4
2013	420	50	30	0	80	-1
2014	420	50	30	0	80	-1
2015	360	45	30	0	75	-6
2016	360	45	30	0	75	-6
2017	300	40	30	0	70	-11
2018	300	40	30	0	70	-11
2019	240	35	30	0	65	-16
2020	240	35	30	0	65	-16
2021	180	30	30	0	60	-21
2022	180	30	30	0	60	-21
2023	120	25	30	0	55	-26
2024	120	25	30	0	55	-26
2025	60	20	30	0	50	-31
2026	60	20	30	0	50	-31
2027	0	0	0	0	0	-81

TABLE 4.15-1
ESTIMATED DIRECT PROJECT EMPLOYMENT

Alternative A - 80-Acre Spacing						
Year	Project Wells	RGC Employees	Local Contractor*	Transient Contractor*	Total Jobs	Net Change in Local Jobs from Present
1996		18	63	83	164	N/A
1997	110	45	113	149	308	77
1998	220	52	113	149	315	85
1999	330	59	113	149	322	92
2000	440	68	113	149	331	101
2001	550	77	113	149	340	110
2002	660	86	113	149	349	119
2003	770	95	113	149	358	128
2004	880	104	113	149	367	137
2005	990	113	113	149	376	146
2006	1103	122	113	149	385	155
2007	1103	122	54	0	176	95
2008	1000	122	54	0	176	95
2009	900	108	54	0	162	81
2010	900	108	54	0	162	81
2011	800	99	54	0	153	72
2012	800	99	54	0	153	72
2013	700	90	54	0	144	63
2014	700	90	54	0	144	63
2015	600	81	54	0	135	54
2016	600	81	54	0	135	54
2017	500	72	54	0	126	45
2018	500	72	54	0	126	45
2019	400	63	54	0	117	36
2020	400	63	54	0	117	36
2021	300	54	54	0	108	27
2022	300	54	54	0	108	27
2023	200	45	54	0	99	18
2024	200	45	54	0	99	18
2025	100	36	54	0	90	9
2026	100	36	54	0	90	9
2027	0	0	0	0	0	-81

TABLE 4.15-1
ESTIMATED DIRECT PROJECT EMPLOYMENT

Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing						
Year	Project Wells	RGC Employees	Local Contractor*	Transient Contractor*	Total Jobs	Net Change in Local Jobs from Present
1996		18	63	83	164	N/A
1997	45	18	44	58	120	-19
1998	90	20	44	58	123	-17
1999	135	23	44	58	125	-14
2000	180	27	44	58	129	-10
2001	225	30	44	58	132	-7
2002	270	34	44	58	136	-3
2003	315	37	44	58	139	0
2004	360	41	44	58	143	4
2005	400	44	44	58	146	7
2006	436	48	44	58	150	11
2007	436	48	21	0	69	-12
2008	436	48	21	0	69	-12
2009	400	42	21	0	63	-18
2010	400	42	21	0	63	-18
2011	360	39	21	0	60	-22
2012	360	39	21	0	60	-22
2013	315	35	21	0	56	-25
2014	315	35	21	0	56	-25
2015	270	32	21	0	53	-29
2016	270	32	21	0	53	-29
2017	225	28	21	0	49	-32
2018	225	28	21	0	49	-32
2019	180	25	21	0	46	-36
2020	180	25	21	0	46	-36
2021	135	21	21	0	42	-39
2022	135	21	21	0	42	-39
2023	90	18	21	0	39	-43
2024	90	18	21	0	39	-43
2025	45	14	21	0	35	-46
2026	45	14	21	0	35	-46
2027	0	0	0	0	0	-81

TABLE 4.15-1
ESTIMATED DIRECT PROJECT EMPLOYMENT

Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing						
Year	Project Wells	RGC Employees	Local Contractor*	Transient Contractor*	Total Jobs	Net Change in Local Jobs from Present
1996		18	63	83	164	N/A
1997	90	30	74	98	202	23
1998	180	34	74	98	207	28
1999	270	39	74	98	211	32
2000	350	45	74	98	217	38
2001	430	51	74	98	223	44
2002	510	57	74	98	229	50
2003	590	63	74	98	235	56
2004	670	68	74	98	241	62
2005	750	74	74	98	247	68
2006	831	80	74	98	253	74
2007	831	80	35	0	116	35
2008	831	80	35	0	116	35
2009	750	71	35	0	106	25
2010	750	71	35	0	106	25
2011	670	65	35	0	100	19
2012	670	65	35	0	100	19
2013	590	59	35	0	94	13
2014	590	59	35	0	94	13
2015	510	53	35	0	89	8
2016	510	53	35	0	89	8
2017	430	47	35	0	83	2
2018	430	47	35	0	83	2
2019	350	41	35	0	77	-4
2020	350	41	35	0	77	-4
2021	270	35	35	0	71	-10
2022	270	35	35	0	71	-10
2023	180	30	35	0	65	-16
2024	180	30	35	0	65	-16
2025	90	24	35	0	59	-22
2026	90	24	35	0	59	-22
2027	0	0	0	0	0	-81

TABLE 4.15-1
ESTIMATED DIRECT PROJECT EMPLOYMENT

Alternative C1 - Security Areas Protection - 160-Acre Spacing						
Year	Project Wells	RGC Employees	Local Contractor*	Transient Contractor*	Total Jobs	Net Change in Local Jobs from Present
1996		18	63	83	164	N/A
1997	55	23	57	75	154	-2
1998	110	26	57	75	158	2
1999	165	30	57	75	161	5
2000	220	34	57	75	166	10
2001	275	39	57	75	170	14
2002	330	43	57	75	175	19
2003	385	48	57	75	179	23
2004	440	52	57	75	184	28
2005	495	57	57	75	188	32
2006	550	61	57	75	193	37
2007	550	61	27	0	88	7
2008	550	61	27	0	88	7
2009	495	54	27	0	81	0
2010	495	54	27	0	81	0
2011	440	50	27	0	77	-5
2012	440	50	27	0	77	-5
2013	385	45	27	0	72	-9
2014	385	45	27	0	72	-9
2015	330	41	27	0	68	-14
2016	330	41	27	0	68	-14
2017	275	36	27	0	63	-18
2018	275	36	27	0	63	-18
2019	220	32	27	0	59	-23
2020	220	32	27	0	59	-23
2021	165	27	27	0	54	-27
2022	165	27	27	0	54	-27
2023	110	23	27	0	50	-32
2024	110	23	27	0	50	-32
2025	55	18	27	0	45	-36
2026	55	18	27	0	45	-36
2027	0	0	0	0	0	-81

TABLE 4.15-1
ESTIMATED DIRECT PROJECT EMPLOYMENT

Alternative C2 - Security Areas Protection - 80-Acre Spacing						
Year	Project Wells	RGC Employees	Local Contractor*	Transient Contractor*	Total Jobs	Net Change in Local Jobs from Present
1996		18	63	83	164	N/A
1997	90	42	106	139	287	67
1998	202	49	106	139	294	74
1999	302	55	106	139	301	80
2000	403	64	106	139	309	89
2001	504	72	106	139	318	97
2002	605	81	106	139	326	105
2003	706	89	106	139	334	114
2004	806	97	106	139	343	122
2005	907	106	106	139	351	131
2006	1010	114	106	139	360	139
2007	1010	114	50	0	165	84
2008	1010	114	50	0	165	84
2009	907	101	50	0	151	70
2010	907	101	50	0	151	70
2011	806	92	50	0	143	62
2012	806	92	50	0	143	62
2013	706	84	50	0	134	53
2014	706	84	50	0	134	53
2015	605	76	50	0	126	45
2016	605	76	50	0	126	45
2017	504	67	50	0	118	37
2018	504	67	50	0	118	37
2019	403	59	50	0	109	28
2020	403	59	50	0	109	28
2021	302	50	50	0	101	20
2022	302	50	50	0	101	20
2023	202	42	50	0	92	11
2024	202	42	50	0	92	11
2025	101	34	50	0	84	3
2026	101	34	50	0	84	3
2027	0	0	0	0	0	-81

TABLE 4.15-1
ESTIMATED DIRECT PROJECT EMPLOYMENT

No Action Alternative						
Year	Project Wells	RGC Employees	Local Contractor*	Transient Contractor*	Total Jobs	Net Change in Local Jobs from Present
1996		18	63	83	164	N/A
1997	25	11	28	37	77	-41
1998	50	13	28	37	79	-40
1999	75	15	28	37	81	-38
2000	100	17	28	37	83	-36
2001	120	19	28	37	85	-33
2002	145	22	28	37	87	-31
2003	165	24	28	37	90	-29
2004	190	26	28	37	92	-27
2005	215	28	28	37	94	-24
2006	226	31	28	37	96	-22
2007	226	31	14	0	44	-37
2008	226	31	14	0	44	-37
2009	215	27	14	0	41	-41
2010	215	27	14	0	41	-41
2011	190	25	14	0	38	-43
2012	190	25	14	0	38	-43
2013	165	23	14	0	36	-45
2014	165	23	14	0	36	-45
2015	145	20	14	0	34	-47
2016	145	20	14	0	34	-47
2017	120	18	14	0	32	-50
2018	120	18	14	0	32	-50
2019	100	16	14	0	29	-52
2020	100	16	14	0	29	-52
2021	75	14	14	0	27	-54
2022	75	14	14	0	27	-54
2023	50	11	14	0	25	-56
2024	50	11	14	0	25	-56
2025	25	9	14	0	23	-59
2026	25	9	14	0	23	-59
2027	0	0	0	0	0	-81

*Seasonal construction employment; the construction season would typically run from May to November of each year.

TABLE 4.15-2

SUMMARY OF NET CHANGE IN DIRECT PROJECT EMPLOYMENT FOR LOCAL AREA RESIDENTS BY ALTERNATIVE

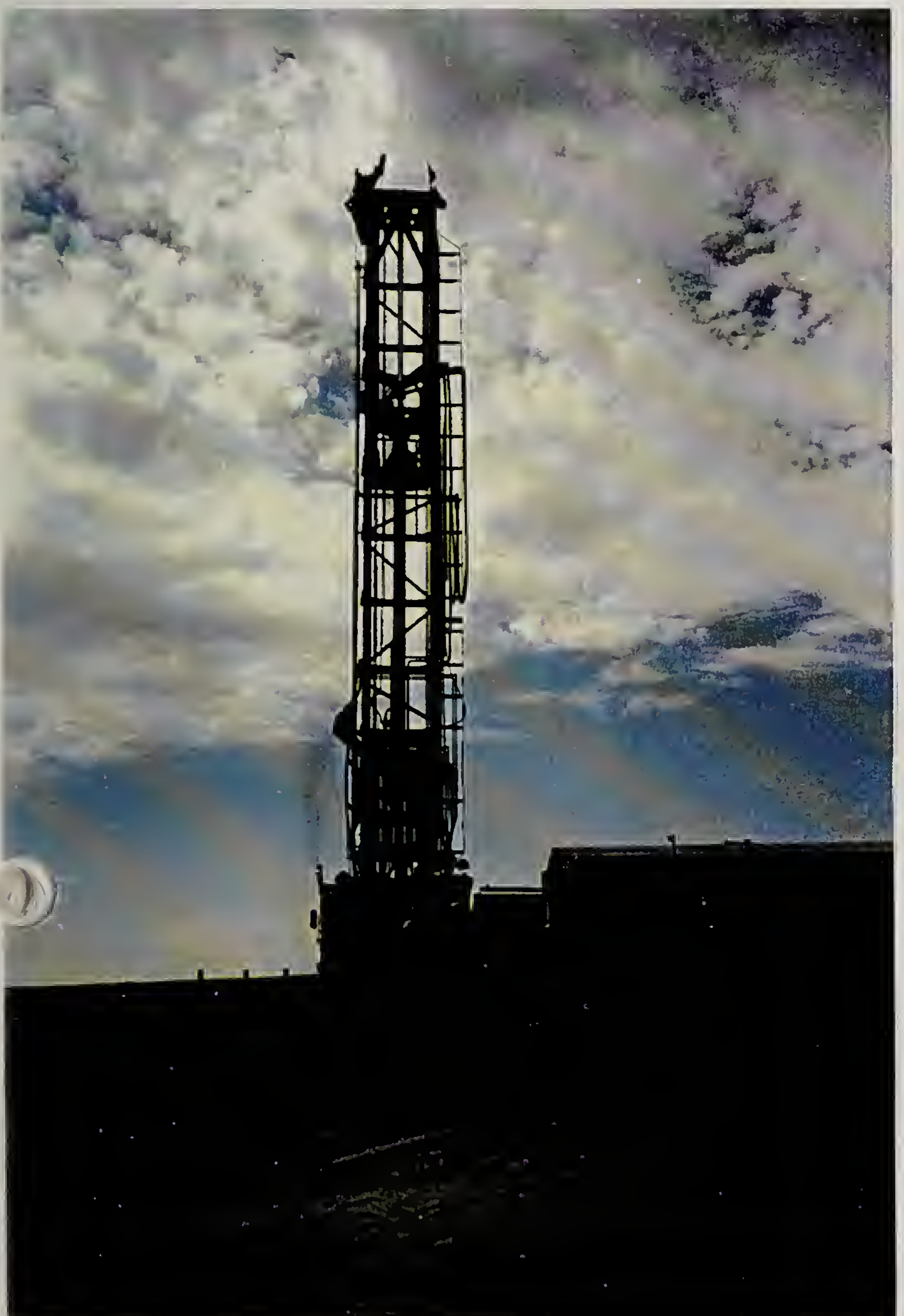
	Proposed Action - 160-Acre Spacing	Alternative A - 80-Acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing	Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing	Alternative C1 - Security Areas Avoidance - 160-Acre Spacing	Alternative C2 - Security Areas Avoidance - 80-Acre Spacing	No Action Alternative
1997	7	77	-19	23	-2	67	-41
1998	11	85	-17	28	2	74	-40
1999	15	92	-14	32	5	80	-38
2000	20	101	-10	38	10	89	-36
2001	25	110	-7	44	14	97	-33
2002	30	119	-3	50	19	105	-31
2003	35	128	0	56	23	114	-29
2004	40	137	4	62	28	122	-27
2005	45	146	7	68	32	131	-24
2006	50	155	11	74	37	139	-22
2007	17	95	-12	35	7	84	-37
2008	17	95	-12	35	7	84	-37
2009	9	81	-18	25	0	70	-41
2010	9	81	-18	25	0	70	-41
2011	4	72	-22	19	-5	62	-43
2012	4	72	-22	19	-5	62	-43
2013	-1	63	-25	13	-9	53	-45
2014	-1	63	-25	13	-9	53	-45
2015	-6	54	-29	8	-14	45	-47
2016	-6	54	-29	8	-14	45	-47
2017	-11	45	-32	2	-18	37	-50
2018	-11	45	-32	2	-18	37	-50
2019	-16	36	-36	-4	-23	28	-52
2020	-16	36	-36	-4	-23	28	-52

TABLE 4.15-2
SUMMARY OF NET CHANGE IN DIRECT PROJECT EMPLOYMENT FOR LOCAL AREA RESIDENTS BY ALTERNATIVE

	Proposed Action - 160-Acre Spacing	Alternative A - 80-Acre Spacing	Alternative B1 - Critical Areas Avoidance - 160-Acre Spacing	Alternative B2 - Critical Areas Avoidance - 80-Acre Spacing	Alternative C1 - Security Areas Avoidance - 160-Acre Spacing	Alternative C2 - Security Areas Avoidance - 80-Acre Spacing	No Action Alternative
2021	-21	27	-39	-10	-27	20	-54
2022	-21	27	-39	-10	-27	20	-54
2023	-26	18	-43	-16	-32	11	-56
2024	-26	18	-43	-16	-32	11	-56
2025	-31	9	-46	-22	-36	3	-59
2026	-31	9	-46	-22	-36	3	-59
2027	-81	-81	-81	-81	-81	-81	-81

Chapter 4.0
Figures

Chapter 5.0



(a) Drilling rig

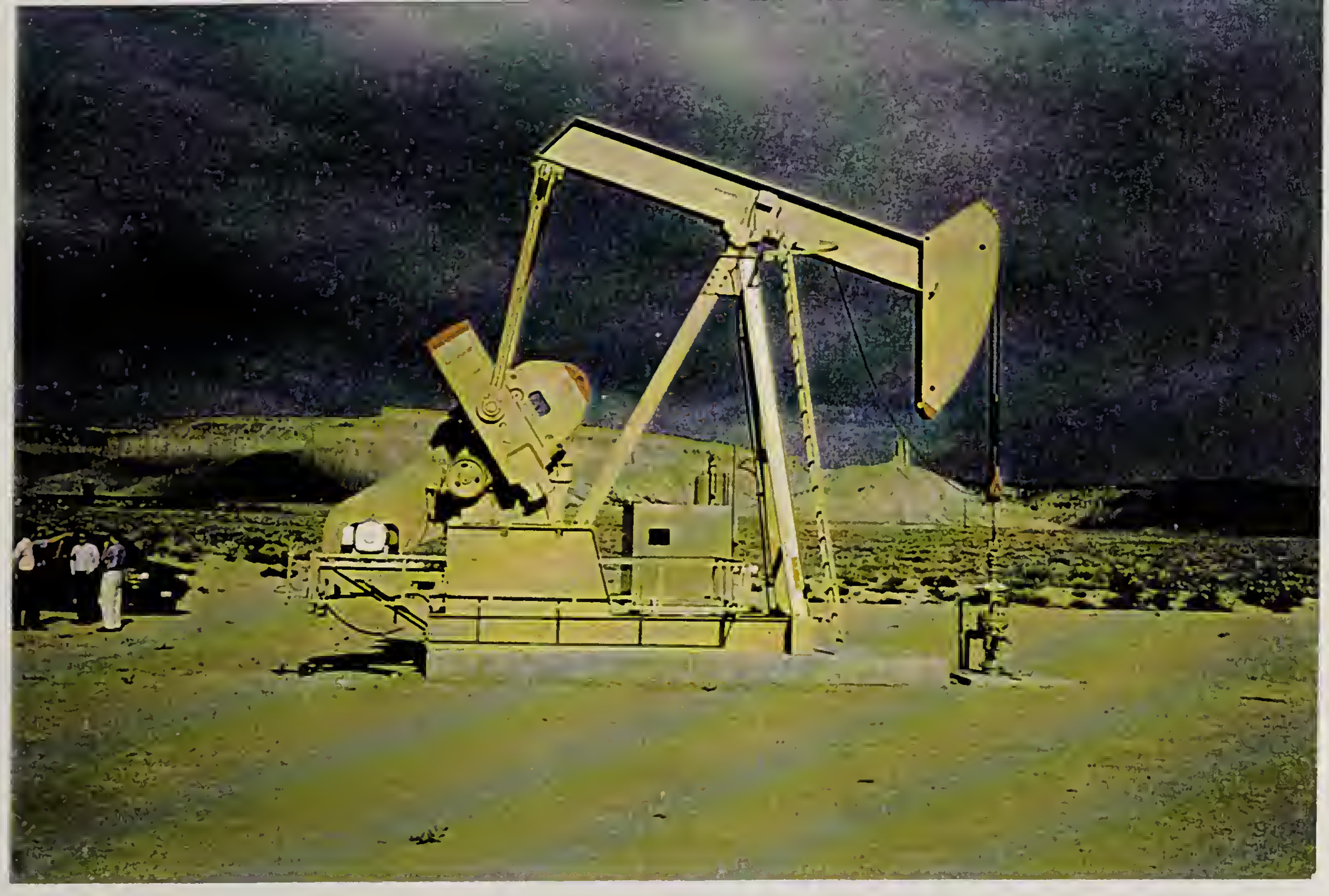
(b) Evaporation pond under construction

Figure 4.13-1(a-b) Typical CBM Construction Equipment and Activities

(a) Electrical control building, gas dehydrators, and gas meter tubes

(b) Water storage tanks

Figure 4.13-2 (a-b) Typical CBM operation equipment - compressor station facility



(a) Existing coalbed methane well with mitigation color treatment

(b) Manhole barricade (yellow) and production unit

Figure 4.13-3 (a-b) Typical CBM Operation Equipment - Well Site

Figure 4.13- 4 Elevated View of CBM Facilities From Middleground to Background Distance

Figure 4.15-1. Net Increase or Decrease in Direct Project Employment of Local Residents by Alternative

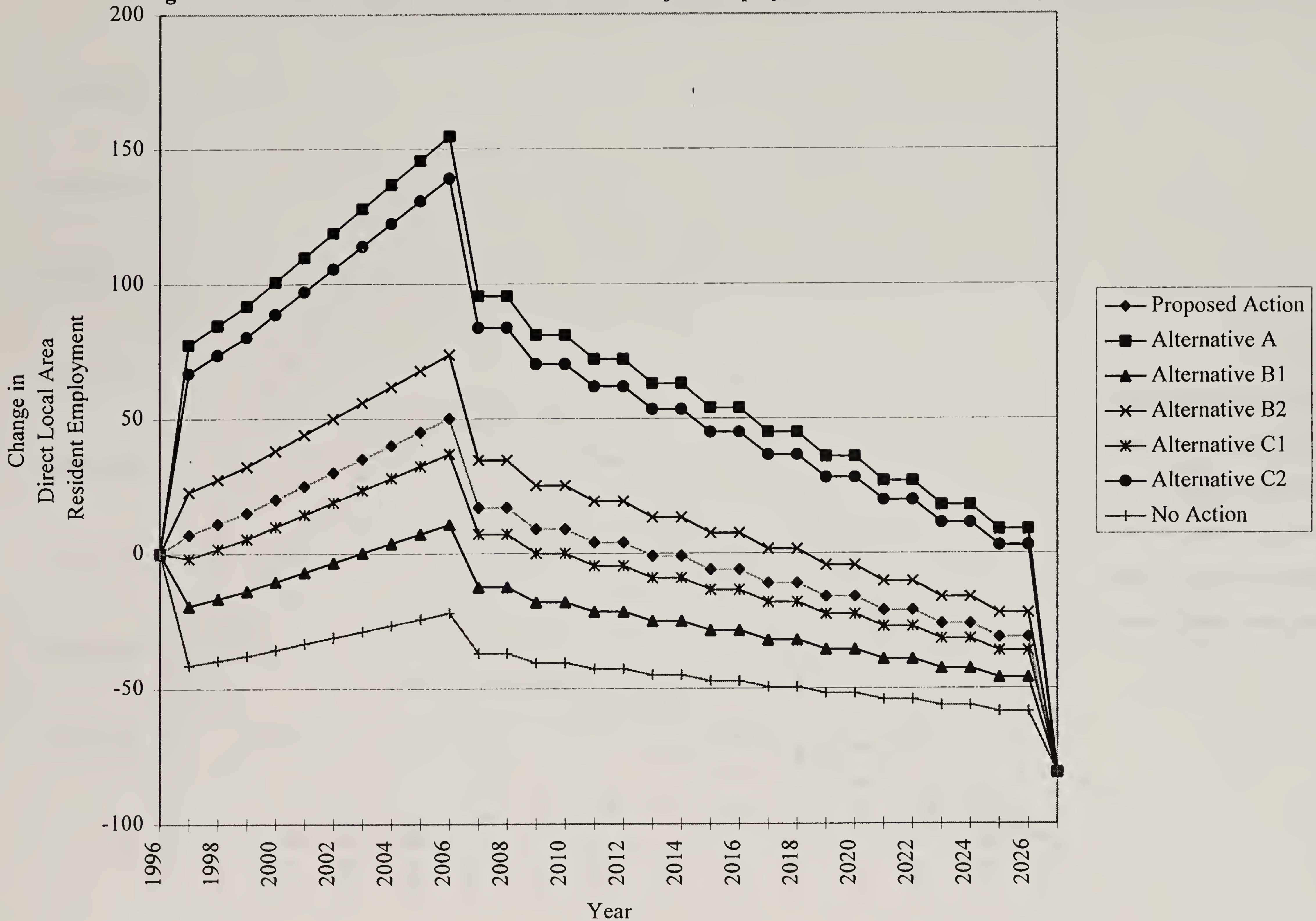


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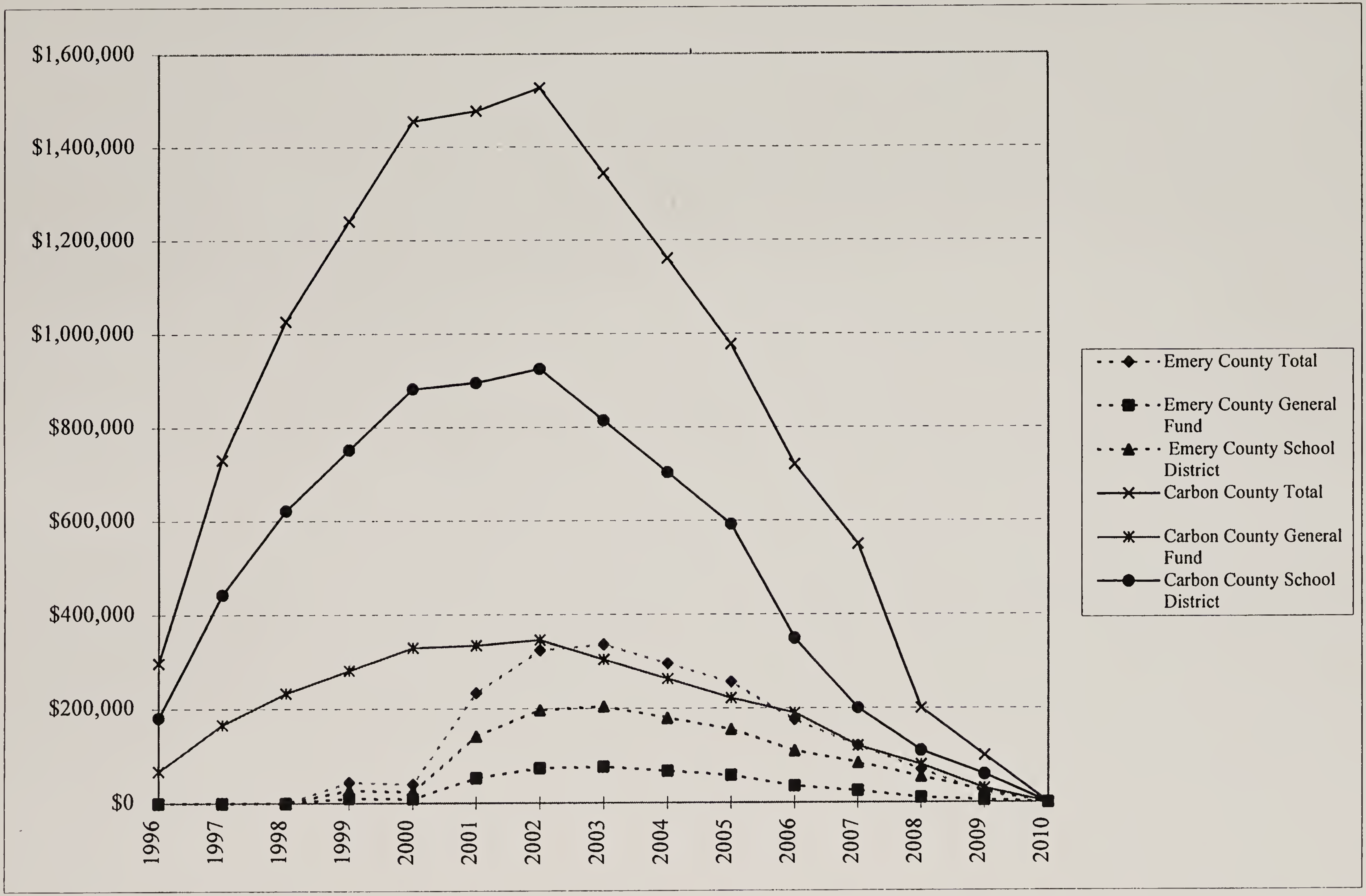
Figure 4.15-2. Estimated Project-Related Ad Valorem Tax Revenue by County



Chapter 5.0

5.1 INTRODUCTION

Compliance with NEPA requires analysis of the cumulative impacts of each alternative. Cumulative impacts are those resulting from the incremental impact of an alternative when added to other past, present and reasonably foreseeable future actions, regardless of who has taken those actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. A cumulative impact scenario has been developed which identifies those past, present and reasonably foreseeable future actions that may contribute to a significant cumulative effect when combined with the effects of the alternatives.

Past and Present Actions Already Analyzed

Humans have altered the environment in numerous ways since settlement times. Table 5.1-1 describes past and present human actions affecting natural resources in the Project Area. These past and present actions have resulted in the affected environment as described in Chapter 3. The cumulative impacts of the actions in Table 5.1-1 have thus been accounted for as part of the impact analysis in Chapter 4, and will not be considered further in this document.

Ongoing and Reasonable Foreseeable Future Actions

Table 5.1-2 provides a listing of presently ongoing activities and reasonable foreseeable future actions which combined with the alternatives could result in a significant cumulative impact. For the reasonable foreseeable future actions (RFFA), it is important to note these are projections made only for the purpose of predicting future impacts. RFFA items are assumptions for analysis and are not part of the Proposed Action or alternatives. Inclusion in the RFFA scenario does not constitute a decision nor a commitment of resources. If a future action requires NEPA compliance, inclusion in this cumulative impact scenario would not satisfy that requirement.

5.2 PROJECTS EVALUATED

A list of key project components and activities for ongoing, proposed, and potential projects to be assessed in this cumulative effects analysis is provided in the following sections. The ongoing and proposed CBM projects are considered to be most likely to cause cumulative impacts, and therefore are described and evaluated in detail. The other projects are described and evaluated in less detail.

5.2.1 Ongoing CBM Projects

Five ongoing CBM exploration and development projects have been approved through the NEPA compliance process and are at various stages of development. Three of the five projects are located north of the Price EIS Project Area; Castlegate CBM Project, Matt's Summit CBM Exploration Project, and Helper CBM Pilot Project. The remaining two projects, the Grimes Wash CBM Pilot Project and Buzzard Bench Project, are located southwest of the EIS Project Area. These projects are shown on Plate 26.

Key project components/activities are identified for each project below:

Castlegate CBM Project

- Up to 124 new wells would be drilled and access roads would be constructed to each wellsite. Along the access roads, pipeline corridors would be constructed for the gas and produced water pipelines from the wells, electrical lines to the wellsites, and high-pressure gas from the compressor facility to each well.

- The high-pressure gas would be used in a gas-lift system to lift the produced water from the coal seams.

- Three central processing facilities would be constructed to provide both gas and water treatment capabilities.

- Gas would be treated to remove water, remove carbon dioxide (CO_2), and be compressed for delivery into a gas sales pipeline 13.8 miles long, which would connect with an existing interstate pipeline.

- The produced water would be treated to reduce its dissolved solids content so it can be discharged to surface streams. Water treatment would consist of passing 80 percent of the water through an electrodialysis or reverse osmosis process to reduce the dissolved solids content. The remaining 20 percent of the water would be discharged to an evaporation pond, and then pumped to an underground injection well for disposal.

- Project facilities would have electrical power from a new substation adjacent to the Utah Power and Light transmission line that crosses the Project Area.

- Permanent abandonment and reclamation of each individual well location in the event that the well is deemed to be commercially non-productive.

Full implementation of the proposed action would result in 824 acres of surface disturbance; 573 acres or 70 percent would be short-term, and would be reclaimed immediately following construction. Interim reclamation would include a portion of each wellpad, substation, road/pipeline corridors, and the entire sales pipeline ROW. The rest of the surface disturbance (251 acres or 30 percent) would remain for the life of the project (25 to 30 years). Areas committed to long-term industrial use would include: (1) road/pipeline corridors; (2) a portion of each wellpad; (3) the substation; and (4) the three central processing facilities.

Matt's Summit CBM Exploration Project

- Drilling of six production wells and one injection well.

- Construction of approximately 12,950 feet of new road necessary for access to the wells proposed for drilling by Anadarko in the Matt's Summit project area.

- Reconstruction of approximately 12,900 feet of existing access road to the Matt's Summit State A-1 which was previously authorized by the BLM under ROW grant UTU-67355.

- Reclamation consistent with the level of operations expected on each

individual well location during evaluation of the coalbed reservoir.

- Installation of a water gathering and disposal system consistent with the preferred method of water disposal. The water gathering/disposal system would involve the installation of approximately 35,477 feet of buried pipeline and 1,750 feet of surface pipeline.

- Permanent abandonment and reclamation of each individual well location in the event that the well is deemed to be commercially non-productive.

Full implementation of the proposed action would result in 42 acres of surface disturbance within the roughly 10,000-acre Matt's Summit project area.

Helper CBM Pilot Project

- Construction, drilling, and completion of five production CBM wells and one injection well

- Construction, drilling and completion of one water disposal well in Township 14 South, Range 10 East of Carbon County, Utah

- Construction and/or reconstruction of approximately 7,386 feet (total) of access road to the five proposed well locations

- Installation of a natural gas compression facility at the water disposal well location

- Interim reclamation of those areas disturbed in association with initial wellpad, access road and pipeline construction

- Final reclamation of those remaining disturbed areas upon project abandonment

Full implementation of the proposed action would result in 43 acres of surface disturbance within the approximately 3,200 acre Helper project area. Construction of wellpads and access roads would total approximately 25 acres of disturbance; pipeline installation would disturb approximately 18 acres. Approximately two acre-feet of fresh water would be required for project implementation.

Grimes Wash CBM Pilot Project

- Construction, drilling, and completion of five CBM wells in Township 18 South, Range 7 East of Emery County, Utah; one well located in Section 10 (completed in 1995) and four additional wells planned for Sections 4, 8, 9, and 10

- Construction or upgrade of an estimated 4.5 miles of road and adjacent, paralleling pipelines/utility facilities

- Interim reclamation of those areas disturbed in association with initial wellpad, access road and pipeline construction

- Final reclamation of those remaining disturbed areas upon project abandonment

Full implementation of the proposed action would result in an approximate total of 18 acres of surface disturbance. The disturbance acreage would be equally attributed to the five

well pads (9.2 acres, approximately 1.8 acres per well pad) and the 4.5 miles of ROW (8.4 acres). One to two D-8 sized bulldozers with operators, a road grader and operator, and a fencing crew would be employed over approximately a one week period to construct well pads and transportation systems. The drilling of wells using standard drilling techniques and equipment would take from one to four weeks per well.

<u>**Buzzard Bench Project**</u>

- Construction, drilling, and completion of 13 CBM wells and four non-CBM gas wells in the southern half of Township 18 South, Range 7 East and the northeastern corner of Township 19 South, Range 7 East, Emery County, Utah

- Construction or upgrade of an estimated nine miles of road and adjacent, paralleling pipelines/utility facilities

- Construction, drilling, and completion of one injection well for the disposal of produced water; the well has been approved but is not yet in use

- Interim reclamation of those areas disturbed in association with initial wellpad, access road and pipeline construction

- Final reclamation of remaining disturbed areas upon project abandonment

Full development of these facilities would result in an approximate total of 42 acres of surface disturbance comprised of 20 acres of road and 22 acres of well pad disturbance. Well pads would be constructed to a one to two percent slope to drain spills and rainwater into a reserve pit (30 feet by 20 feet by 8 feet). Each 1.25-acre well pad would be bermed and ditched to prevent water from entering and exiting the pad. The wells would be drilled to a depth of 3,135 to 3,250 feet below ground level into the Ferron Sandstone using standard air-drilling techniques.

5.2.2 Proposed CBM Project

The other proposed CBM project yet to go through the NEPA compliance process is the Helper-Price CBM Project (Plate 26). This project is proposed as an expansion of the Helper CBM Pilot Project. The 64 proposed additional production wells surround the completed five pilot wells to the east, south, and west.

Key project components/activities for the Helper-Price CBM Project are identified below:

- Construction, drilling, completion, and stimulation of 64 additional CBM wells in the southern portion of Township 13 South, Range 10 East and the northern portion of Township 14 South, Range 10 East, Carbon County, Utah

- The proposed Helper-Price CBM project area straddles the EIS Project Area boundary just north of Price, Utah. Approximately 16 (25 percent) of the 64 proposed wells would be located within the EIS Project Area

- Proposed well locations approximate a 160-acre well spacing distribution

- Construction or upgrade of approximately 35 miles of road and

adjacent, paralleling pipeline/utility facilities

- Use of an existing injection well for the disposal of produced water
- Use of an existing central production facility
- Interim reclamation of those areas disturbed in association with initial wellpad, access road and pipeline construction
- Final reclamation of remaining disturbed areas upon project abandonment

Full development of the 64 additional wells would result in an estimated 396 acres of disturbance from the construction of well pads (228 acres), and road and adjacent pipeline/utility facilities (168 acres). Of the 64 proposed wells, 48 are located outside of the EIS Project Area, and are therefore not accounted for in the potential additional drilling development scenarios discussed in Section 5.2.3. Construction of the 48 wells and approximately 23 miles of road/road upgrade would effect a net additional disturbance of 282 acres. Development of the 64 wells and associated roads would be conducted over a three- to four-year period. Produced water would be piped to the existing injection well developed as part of the Helper CBM Pilot Project.

5.2.3 Potential CBM Projects

Potential projects include (1) the development of wells in remaining available well spacing locations within the EIS Project Area; (2) the development of CBM wells along the entire Ferron Fairway; and (3) the construction and operation of an additional interconnect transmission pipeline to transport CBM gas from areas south of the EIS Project Area to the main east-west Questar transmission pipeline.

Additional Drilling within the Price CBM EIS Project Area

The potential for drilling other available well locations is based on the presence of continuous CBM reserves throughout the EIS Project Area, as well as the existence of leases held by other oil and gas companies within the EIS Project Area. Additional drilling of areas not controlled by RGC within the EIS Project Area would result in an increase of wells, miles of transportation systems, and numbers of ancillary facilities (compressor stations, injection wells, and evaporation ponds) beyond those proposed for construction and operation under the Proposed Action and each of the project alternatives (Alternatives A, B1, B2, C1, C2, and No Action).

Plates 28 to 34 present a potential distribution of well locations and transportation corridors should full development (i.e., all available well spacing windows are occupied by a well) occur under the limitations posed by the Proposed Action and the alternatives. Tables 5.2-1 through 5.2-7 present the numbers, miles, and acreages of facilities/disturbance for potential additional drilling in the Project Area, using the well spacing and siting constraints of each of the seven alternatives. Additional facilities that would be affected by raptor restrictions and winter closure are presented in Tables 5.2-8 and 5.2-9. The rate of consumption of sand and gravel and water in the construction and development of additional wells, roads, pipelines, utilities, and ancillary facilities would be equal to rates presented for the Proposed Action and each of the alternatives described in Section 2.0.

Sand, gravel, and water consumption by facility type is presented in Table 5.2-10.

Ferron Fairway

The Ferron Sandstone coalbed gas fairway (termed Ferron Fairway) is a six to 10 mile wide band extending more than 80 miles from north of the town of Price, Utah, to beyond Emery, Utah in the south (Plate 27). Ultimate recoverable gas reserves from the Ferron Fairway are estimated at between four and nine trillion cubic feet. Development of the entire 544,000-acre Ferron Fairway could support about 3,400 gas wells drilled on 160-acre centers. The shallower (1,000 to 4,500 feet deep) eastern side of the Ferron Fairway covers approximately 211,200 acres and could accommodate 1,320 gas wells. Deeper portions of the Fairway (4,500 to 9,000 feet) under the Wasatch Plateau and Book Cliffs cover about 332,800 acres, and could potentially support another 2,080 wells (Utah Geological Survey 1995).

The Ferron Fairway includes more than half of the EIS Project Area, and nearly all of the Drunkards Wash Unit. The estimated 3,400 gas wells in the Ferron Fairway at 160-acre spacing include wells that are part of the Proposed Action, and wells that are part of the Additional Drilling/Proposed Action scenario. In addition, all of Grimes Wash, Helper and Matt's Summit Projects, and about half of the Buzzard Bench Project are within the Ferron Fairway. Excluding the wells evaluated for those projects, there would be approximately 2,800 additional wells in the Ferron Fairway at 160-acre spacing (or 5,600 wells at 80-acre spacing). The minimum estimated disturbance resulting from these wells at 160-acre spacing would be:

- 3,020 acres for wellpads (assuming 1.4 acres per well pad)
- 11,600 acres of construction disturbance for transportation corridors (assuming one-half mile per well [1,400 miles total] and a 77-foot wide transportation corridor)
- About 300 to 400 acres for compressor stations, injection wells, and evaporation ponds

The BLM will be preparing a programmatic EIS to analyze in detail the potential effects of CBM development within the Ferron Fairway.

North-South Interconnect Pipeline

Development of the CBM gas reserves of the Ferron Fairway would require construction of a new natural gas pipeline to link all of the various CBM projects with the existing Questar pipeline system for sales and transportation. It is assumed that this gas pipeline would be approximately 20 inches in diameter, and would extend from the southernmost extent of CBM development to the vicinity of the EIS Project Area. It could be located anywhere in the CBM trend, but would most likely be located near Utah State Highway 10. There would be approximately 64 miles of pipeline and approximately 640 acres of disturbance, assuming a 75-foot wide construction ROW and ancillary facilities such as compressor stations and metering sites. Construction methods would be similar to those described in Section 2.2.2.3. Disturbance would be mostly short-term because reclamation and revegetation would be initiated at the end of construction.

5.2.4 Other Projects

Proposed Power Plants

Hunter Unit IV. Utah Power and Light (UP&L) proposed an additional generating

unit at the Emery Power Plant located south of Castle Dale, Utah. In 1979, the BLM prepared an EIS analyzing the additional unit. UP&L has since withdrawn their permit application with the Utah Division of Air Quality. Hunter Unit IV is no longer considered a reasonable foreseeable future action, and is not included in the cumulative impacts analysis.

Hiawatha Co-generation. This proposed project at the western edge of the EIS Project Area involves coal gasification and power generation. The Utah Division of Air Quality is currently reviewing a permit application for the project. The major air quality issue is sulfur dioxide emissions (Blanchard 1996). Sulfur dioxide is not a pollutant of concern for the Price CBM Project, and therefore no significant cumulative impacts would be expected. However, sulfur dioxide emissions would contribute to regional haze. Since no other information on the Hiawatha project is currently available, this project is not included in the cumulative impacts analysis.

<u>Proposed and Potential Coal Mines</u>

Four new coal mines have been proposed in the general vicinity of the EIS Project Area, of which one is under construction. The locations of these mines are shown on Plate 27. Three are located along the Book Cliffs north and east of the EIS Project Area, and one (Blue Blaze) is located a few miles northwest of the EIS Project Area. These four mines would disturb about 252 acres, including both the mine sites and the roads which would be built or improved to provide access to the mines. Available information about each mine is summarized below:

- **Willow Creek Mine.** Owner/ proponent: Cyprus Plateau Mining Company. This underground mine located at an old mine site would result in an estimated 20 acres of surface disturbance. The mine is currently under construction and has road access located along Highways 6 and 191. No new employment is expected, since workers will transfer from other mines. The surface land ownership is private. The access roads are located on federal land.

- **Dugout Canyon Mine.** Owner/ proponent: Soldier Creek Mining Company. This underground mine would require eight miles of access road, disturbing approximately 140 acres for the road and ancillary facilities. About 10 acres would be disturbed for the mine. The surface land ownership is private.

- **B Canyon Mine.** Owner/Proponent: British Petroleum Coal Company. This underground mine would require 3.5 miles of upgraded access road disturbing approximately 62 acres. An estimated 10 acres would be disturbed for the mine. Approximately 40 to 50 new employees would be hired. The surface land ownership is mostly public land managed by BLM.

- **Blue Blaze Mine.** Owner/proponent: Horizon Coal Corporation. This underground mine currently has an access road. Approximately 10 to 20 acres would be disturbed for the mine. Approximately 40 to 50 new employees would be hired. The surface land ownership is private.

- **Horse Canyon South**. According to UDOGM, this underground coal mine was active in the early 1980's and closed around 1984. The case lease is still valid, however, there are no proposals to develop the mine. The area is currently permitted for reclamation. If this mine were to become active again, it is assumed that approximately 20 to 30 acres of the former mine site would be re-disturbed; approximately 200 employees would be hired, and the existing roads would be upgraded. The surface land ownership is federal.

Community Expansion

Seven subdivisions in or near the EIS Project Area have been approved in Carbon County, but have not yet been developed. Available information provided by Carbon County Building and Planning Department about these areas is presented below.

- **Rosewood Estates.** South of Wellington. Approved in 1996. Nine lots, 65 acres.
- **Circle K Subdivision** Phase IIIA. South of Price. Approved in 1996. 17 lots, 28 acres.
- **South Meadows.** South of Price. Approved in 1996. Plat A: nine lots, 13 acres. Plat B: 27 lots, 30 acres.
- **Leavitt's.** Near Price. Approved in 1996. Eight lots, 40 acres.
- **Westwood Phase IIIA.** Near Price. Approved in 1982. Six lots, 25 acres.
- **Broken Mesa.** Near Price. Approved in 1995. Nine lots, six acres.
- **O'Brien.** Near Price. Approved in 1996. 12 lots, two acres.

Future Logging

Logging could take place in the future on state and private land near the EIS Project Area. Potential logging areas that could impact resources also affected by the Price CBM Project include: private lands on the Wasatch Plateau west of Hiawatha and Wattis (headwaters of Cedar and Miller Creeks); private and state lands northwest of the EIS Project Area (headwaters of the North Fork of Gordon Creek); and private and state lands north of the EIS Project Area within the watershed of the Price River.

Gooseberry Narrows Dam

The U.S. Bureau of Reclamation is currently preparing an EIS on this proposed project. The purpose of the project is to develop an additional supply of municipal water to support population growth in north Sanpete County, Utah. The reservoir capacity is approximately 17,00 acre-feet, and the project diverts 5,400 acre-feet per year creating a depletion in the Price River drainage of 600 acre-feet per year (U.S. Bureau of Reclamation 1996).

5.3 CUMULATIVE IMPACT ASSESSMENTS

Based on the conclusions on direct and indirect impacts analyzed in Chapter 4.0, there is a potential for significant cumulative impacts for the following resources: water, air, soils, wildlife, recreation, visual and socioeconomics. Cumulative impact assessments are presented below for the projects and resources summarized in Table 5.1-2.

5.3.1 Water Resources

Cumulative impacts of concern on water resources relate to consumptive use and coal seam dewatering from CBM development; groundwater flow interception from coal mines; consumptive use from subdivision development; sedimentation from logging activities, and diversion of water from the Price River drainage for the Gooseberry Narrows Dam project.

Ongoing, Proposed and Potential CBM Projects

Coal Seam Dewatering. There is a potential for cumulative impacts on the water resources of the Ferron Sandstone from dewatering associated with CBM development. The number of production wells under the potential Additional Drilling/Proposed Action scenario and the other CBM projects that produce from the Ferron coals would be 1,116 wells, which is a 66 percent increase over the EIS Proposed Action. The most production wells would be associated with the Additional Drilling/ Alternative A and other CBM projects scenario, totaling approximately 2,345 wells. This would be approximately three times as many wells as for the EIS Proposed Action. It is difficult to calculate the volume of water that would be produced from individual wells under the different scenarios due the combined drawdown effect between two or more wells, and the unsteady water production rate during a well's lifetime. However, assuming similar water production rates as anticipated for the Proposed Action, the volume of water withdrawn from the Ferron coals would increase proportionally with the number of wells. Water would also be withdrawn from the Blackhawk Formation as part of the Castlegate and Matt's Summit Projects. The Black Hawk formation is part of the Mesaverde aquifer and stratigraphically overlies the Mancos Shale. The Black Hawk formation does not exist within the EIS Project Area, and in the surrounding area is separated from the Ferron Sandstone by some 4,000 feet of Mancos Shale. Therefore, there would be no potential that the withdrawal of water from the Black Hawk Formation would have any cumulative impact on the water resources of the Ferron Sandstone. As discussed in Section 4.2.1.1, the poor water quality and depth of the Ferron Sandstone renders the water within it uneconomical for most uses. As for now, the only beneficial use for this water is the recovery of the CBM resource. Therefore, the cumulative production of water from the Ferron Sandstone is not considered a significant impact to the quantity or quality of the water in the coal seams.

Disposal of the waters resulting from coal seam dewatering has the potential to impact the water resources of the Navajo-Nugget Aquifer. The disposal of produced water resulting from the Proposed Action, ongoing and proposed projects, and potential additional drilling within the EIS Project Area is estimated to require at 16 injection wells; two times as many as would be needed for the EIS Proposed Action. The Additional Drilling, Alternative A and other CBM projects scenario would potentially require the most injection wells totaling 23 wells. Assuming each of these injection wells would carry a maximum of 10,000 BWPD, and that they are all positioned in the immediate vicinity of the Project Area, then no adverse cumulative impacts to the water quality of potable portions of the Navajo-Nugget aquifer would be anticipated. This aquifer is not an important water source in the EIS Project Area because of its poor water quality and great depth. The ongoing Castlegate and Matt's Summit projects inject their surplus

produced waters into the Spring Valley Sand Member of the Star Point Formation. This formation is not found within the EIS Project Area (USGS Map of Price Quadrangle).

The risk of causing water quality degradation in portions of the Navajo-Nugget Aquifer as a result of injecting produced waters would increase significantly if all the proposed and reasonable foreseeable projects were developed. However, management of the injected water under the UDOGM UIC Permit process should prevent any adverse impacts to the quality of the groundwater resources.

Water Use. The ongoing, proposed and potential projects that are part of this cumulative analysis would all likely require water for well drilling and stimulation, and construction of roads, well pads, evaporation ponds and compressor stations. Water would also be consumed for dust suppression by either direct application or for preparing magnesium chloride solution. No volume estimates are available for water use requirements; however, based on the number of wells, the cumulative water requirements could exceed the Proposed Action estimates by as much as 60 percent. However, due to the staged development of drilling and stimulation of wells, construction of roads, etc., fresh water demands should not increase significantly at any one time. It is assumed that all future developers would have to enter into an agreement with the Price River Water Improvement District or the appropriate community or irrigation district to purchase or lease water as discussed in Section 2.2.2. It is the responsibility of the Utah Department of Natural Resources, Water Rights Division to regulate the use of water in the state of Utah. The Water Rights Division would evaluate on a case-by-case basis with any developer filing a change of use application based on the prior consumptive use. Therefore, the cumulative use of water for the ongoing, proposed CBM projects, potential additional drilling within the EIS Project Area, and the Proposed Action should not result in any significant impact to available water sources, although substantial changes in water use type would occur, primarily from agriculture to industrial use.

Protection of water resources under any of the alternatives is largely reliant upon the application of appropriate management, design, construction, and environmental protection measures, and the timely implementation of effective mitigation measures in the event of a problem. These measures would likely be implemented irrespective of which alternative is selected; however, the potential for adverse impacts to occur due to the failure of one or more of these measures increases proportionally with the magnitude of the project. Therefore, the potential for significant cumulative impacts to water resources to occur is highest for Alternative A and lowest for the No Action alternative.

In summary, the ongoing or proposed CBM projects in the area, the potential additional drilling within the EIS Project Area, and the Proposed Action are not expected to result in any significant impacts to the water resources of the area.

Ferron Fairway. Another potential CBM project considered in this cumulative analysis is the development of the Ferron Sandstone gas fairway (Ferron Fairway). As this is only a potential project, very little quantitative information is available on how this type of project would take shape. Therefore, this analysis is restricted to the potential components of the project that could result in an impact to the water resources of the area. Assuming that production and disposal volumes in this expanded area would be

similar to that observed with the Proposed Action, it is estimated that an additional 2,800 production wells would be developed at a 160-acre spacing. This number of production wells may require as many as 30 additional injection wells to dispose of the production water and could result in as much as 15,000 acres of additional surface disturbance.

This potential project could result in approximately twice the acreage of disturbance and number of production and injection wells that are currently anticipated for the Additional Drilling/Alternative A scenario. Additionally, development of the Ferron Freeway would require construction of a new natural gas pipeline to link all the various projects to allow for transportation and sales. This pipeline network would require approximately 640 acres of surface disturbance to construct. If the Ferron Fairway were developed in a similar manner to what has been described for the Proposed Action, the potential for significant impacts to the water resources of the area is high. These activities could: (1) potentially result in significant degradation of surface water quality due to the amount of surface disturbance for drillpads, pipelines and roads, (2) result in water disposal problems as suitable aquifers such as the Navajo Sandstone may not have the injection capacity to handle the required volumes, (3) reduce flow of streams and springs where the Ferron currently discharges south of the Project Area in Emery County; and (4) increase water shortages as significant additional volumes of fresh water would be required for drilling and operation of such a project.

Other Projects

Other projects in the vicinity of the EIS Project Area that could contribute to cumulative impacts to water resources include proposed and potential coal mines, expansion of residential communities, future logging, and the construction and operation of the proposed Gooseberry Narrows Dam.

Proposed/Potential Coal Mines. Very little information is available regarding the proposed and potential coal mines in the area other than the general location and probable area of surface disturbance. A total of 262 acres of surface disturbance is anticipated for road construction and mine facilities. Assuming that all the projects would be developed as underground mines, there would be little potential for the diversion of significant volumes of surface water. Surface water quality could potentially be degraded due to erosion and sediment runoff from construction activities; however due to the comparatively small acreages of disturbance and significant distance from the EIS Project Area, there would be little potential for cumulative impacts to surface water quality.

Groundwater would likely have to be pumped from the coal mines in order to dewater the underground excavation and allow access. It is not known at what depths or which specific coal formations would be mined. However, based on the location of the mines, it is unlikely that the dewatering of the coal mines would intercept and have a cumulative impact on the water withdrawal from the Ferron Sandstone.

Community Expansion. Available information suggests that as many as 70 new lots could be developed within seven new housing developments located within or near the Project Area. Assuming a per capita water

use of 100 gallons/day and an average inhabitance of 3.5 people per lot, the consumptive use of potable quality water could increase by as much as 24,500 gallons/day (275 ac-ft/yr). This water use represents only 0.4 percent of the total municipal water use for Carbon and Emery Counties. Therefore no significant impact to water resources would be expected as a result of these housing developments; however, any new use of water resources would require that an existing water usage or water right be reduced. It is the responsibility of the Utah Department of Natural Resources, Water Rights Division to regulate the diversion of water in the State of Utah.

Future Logging of State and Private Land. Very little information is available on the magnitude and location of future timber harvests, except that it is likely that such logging would occur in the headwaters of Cedar and Miller Creeks, headwaters of the North Fork of Gordon Creek and within the watershed of the Price River. Impacts to surface water resources from increased sedimentation have their highest potential to occur soon after felling of the trees. These impacts should not be significant if crossings of perennial reaches of streams are minimized during any new road constructions and if felling maintains a buffer zone on either side of the streams. However, some minor increases in suspended solids and TDS concentrations would be expected in the short- to mid-term until the logged areas are revegetated. No significant cumulative impact to surface water quality or flow is expected as a result of the potential future logging.

Gooseberry Narrows Dam Proposed Project. According to the U.S. Bureau of Reclamation, approximately 600 ac-ft/yr would be depleted for the Gooseberry Narrows Dam project from the Price River drainage basin. The estimated water consumption would be 49 ac-ft/yr for the Proposed Action and 85 ac-ft/yr for Alternative A. This represents 8 to 14 percent of the depletion from the Gooseberry Narrows project. Considerably more water would be consumed should all the potential additional drilling take place at the same time as the Proposed Action.

5.3.2 Air Quality

The impact of existing projects is reflected in the background ambient air quality in the EIS Project Area. Cumulative impacts to air quality arise from the interaction of emissions from the Proposed Action (or alternatives) and the reasonable foreseeable CBM projects. The CBM projects include components similar to those analyzed for the Proposed Action and alternatives. These components include construction of new wells, roads and pipelines, as well as construction and operation of compressor stations.

These projects would involve an additional 285 to 1,100 wells, 61 to 87 miles of transportation corridors, and 3 to 7 compressor stations within the EIS Project Area (Tables 5.2.1 to 5.2.7). Additional CBM facilities would be located outside of the EIS Project Area, extending from north of Price to south of Emery. These include the five ongoing CBM projects, the proposed Helper-Price CBM Project, and development of the Ferron Fairway. Altogether, these projects would involve an estimated 3,000 wells, 1,450 miles of transportation corridors, and 20 or more compressor stations.

To estimate the potential cumulative emissions from operation of compressor stations, it was assumed that the ratio of well to compressor units for the 160-acre alternatives evaluated in Chapter 4 would also

apply to the cumulative impact analysis. This ratio was 10.65 to 10.83 wells per 1700 hp compressor unit for the four 160-acre spacing alternatives, with an average of 10.75 wells per compressor unit. The ratio for the 80-acre spacing alternatives averaged 16.5 wells per compressor unit. Applying these ratios to the additional CBM facilities within the EIS Project Area would result in an additional 27 to 67 compressor units being used, with Additional Drilling/No Action having the least, and Additional Drilling/Alternative A having the most. Outside the EIS Project Area, the 3,000 additional wells would result in 279 additional compressor units being used. The cumulative total number of compressor units (including the RGC Proposed Action, the additional drilling scenarios within the EIS Project Area, and the proposed and potential projects in surrounding areas) is as follows:

- Cumulative/Proposed Action - 384 compressor units
- Cumulative/Alternative A - 419 compressor units
- Cumulative/Alternative B1 - 363 compressor units
- Cumulative/Alternative B2 - 389 compressor units
- Cumulative/Alternative C1 - 375 compressor units
- Cumulative/Alternative C2 - 405 compressor units
- Cumulative/No Action - 338 compressor units

As discussed in Section 4.3, construction activities would take place on a temporary basis and would result in locally elevated levels of fugitive particulate and gaseous pollutants from equipment exhaust. However, the areal extent of impact from such activities is expected to be confined to the immediate area of the activity. Based on the expected spacing between project components and the staging of construction activities over time, no significant cumulative interaction is expected between construction impacts. Similarly, any visible dust plumes from construction activities would be highly localized in nature and no significant impacts to regional visibility would be expected.

The primary operational impacts of the proposed project and alternatives would result from emissions of pollutants from the operation of natural gas-fired compressor engines. Based upon dispersion modeling conducted for the Proposed Action and alternatives, operation of a typical CBM compressor station would not result in significant air quality impacts. Interaction between emissions from the proposed compressor stations and compressor stations from the cumulative projects would depend upon the number of gas-fired engines at each site and the proximity of the compressor stations to each other.

The estimated number of compressor units would increase by about 5.9 times compared to the EIS Proposed Action alone, and by about 5.7 times for EIS Alternative A. However, the area throughout which these facilities would operate is at least 3 times larger than the EIS Project Area. Projected air quality impacts from the Proposed Action alone were estimated using air pollutant dispersion modeling to be about 20 percent of the NO_2 standard, and 5 percent of the 8-hour CO standard (Section 4.3). Modeling assumed that one-half of the RGC compressor units would be gas-fired, and the remainder driven by electricity. Based on this same assumption, and the estimated numbers of cumulative compressor units and their dispersal over a larger area, it appears unlikely that air quality

standards would be exceeded on a regional basis. However, depending on the proximity of CBM compressor stations and other sources to each other and on dispersion conditions, exceedance of air quality standards may be an issue during permitting of some compressor stations, and may entail additional mitigations to prevent exceedances of standards.

Emissions of nitrogen oxides from the compressor stations would contribute to regional haze and reductions in visibility. Depending on compressor station locations and emissions, visible plumes from some compressor stations might be observable from local communities under adverse meteorological conditions.

5.3.3 Soils

The cumulative impacts analysis for soils resources includes five CBM exploration and development projects in the vicinity of the EIS Project Area; the proposed expansion of Helper CBM Pilot Project; and potential future development in the EIS Project Area. In addition, reasonable foreseeable actions including development of the Ferron Fairway CBM gas reserves and the Questar Pipeline System would potentially impact soils resources. These projects have disturbed or would disturb soils with similar characteristics as those in the EIS Project Area. Therefore, impacts to soils from construction and operation activities would be similar to those described in Section 4.4. Long-term impacts include removal of vegetation, exposure of the soil, mixing of soil horizons, soil compaction, loss of topsoil productivity, and increased susceptibility of the soil to erosion. These impacts could increase runoff, erosion, and off-site sedimentation of saline soils.

Soils impacts associated with each of the projects is as follows:

Ongoing CBM Projects

- Castlegate CBM Project - Short-term impacts to 824 acres would be reduced to 251 acres of long-term impacts following interim reclamation. Of this total, 41 acres have a high erosion potential. Disturbance of saline soils was not analyzed in the EIS for the Castlegate Project. However, according to the soil survey (USDA, SCS 1988), none of the soils rated high for erosion potential are highly saline.

- Helper CBM Pilot Project - Short-term impacts to 43 acres would be reduced to approximately 6 acres following interim reclamation. None of the soils impacted have a high erosion potential nor are they highly saline.

Detailed, quantitative soils information was not available for the following existing and proposed projects, but the regional soil surveys provide general information, as noted below.

- Matt's Summit CBM Exploration Project - Full development of this project would disturb 42 acres in the short-term. Long-term impacts after reclamation would affect 12 acres. Soils are shallow to very deep loams and clay loams on the lower slopes less than 30 percent. Soils on the steeper slopes are moderately deep, bouldery, sandy loams. For all of these soils, the potential for erosion is moderate, salinity is low, and they are rated fair to good for use as

reclamation material (USDA, SCS 1988).

- Grimes Wash CBM Pilot Project - Implementation of this project would result in 18 acres of disturbance, most of which is likely to be long-term. Most of the soils in the project area are deep, stony, sandy loams, on 0-20 percent slopes. The erosion potential is slight to moderate, and the soils are slightly to moderately saline. Sheet erosion is active. Rockland is also prominent in this area. It is barren rock and shale on steep slopes that are moderately to severely eroded (USDA, SCS 1970).

- Buzzard Bench Project - Full development of this project would result in 42 acres of disturbance. Again, most of this is assumed to be long-term. Soils in this area are similar to those of the Grimes Wash area, but also include badlands - barren, actively eroding shale on steep slopes. Other soils in the area include loams and silty clay loams on 0-20 percent slopes. The potential for erosion is moderate, but rill and gully development and sheet erosion are active. These soils are slightly to strongly saline (USDA, SCS 1970).

<u>**Proposed CBM Project**</u>

- Proposed Expansion of the Helper-Price CBM Pilot Project - Full development of the Helper project would result in 396 acres of disturbance. Soils in the project area are similar to those in the northeast EIS Project Area, north of Price. In general, they are loams, silt loams, and sandy clay loams on nearly level to gently sloping hills. The potential for erosion is moderate, and salinity is low for most of the soils. Most of the soils would also be rated fair for use as reclamation material. Strongly interspersed throughout this area are both badlands and rock outcrops on steep slopes (USDA, SCS 1988).

In summary, full development of these ongoing and proposed projects would disturb 1,365 acres in and around the EIS Project Area. These soils have characteristics similar to those described in Section 3.4. Generally they are loams and sandy loams on nearly level to moderately steep slopes. The potential for erosion is moderate, salinity is low, and the soils are rated fair to good for use as reclamation material. These soils would not fall within the sensitive soil categories.

It is assumed standard, best management practices to control erosion and sedimentation, and monitoring or revegetation efforts with retreatment as necessary would be implemented on all of these projects. Therefore, cumulatively, impacts to soils could be kept to non-significant levels.

<u>**Potential CBM Projects**</u>

Additional Drilling Scenarios. Additional cumulative impacts to the soils resource would occur within the EIS Project Area if all remaining available well spacing locations were developed as discussed in Section 5.2.3. The potential additional drilling within the EIS Project Area would result in impacts similar to those described for the Proposed Action; however, the magnitude of the impacts would be greater.

Implementation of the EIS Proposed Action would result in the disturbance of 2,512 acres of sensitive soils (Table 4.4-1). Should

additional drilling within the EIS Project Area occur, another 1,489 acres would be disturbed. About 45 percent of this additional development would occur on the eastern part of the EIS Project Area where soils have a moderate to high erosion potential, salinity is high to very high, and the material is rated poor for use as reclamation material. The remaining 55 percent of additional drilling would occur primarily in soils not considered sensitive. Thus, cumulatively, impacts from the Proposed Action and potential additional drilling would affect about 3,182 acres of sensitive soils in the region. This would be approximately a 27 percent increase in impacts to soils compared to the Proposed Action.

To reduce potentially significant impacts, the same environmental protection measures to control erosion and sedimentation, discussed in Section 4.4, would have to be applied at a much larger scale. Additionally, a 27 percent increase in reclamation, revegetation, and monitoring efforts would be necessary.

Development of Alternative A in conjunction with impacts from potential additional drilling would result in the greatest amount of disturbance. As with the Proposed Action, approximately 45 percent of additional development would occur on sensitive soils. Cumulatively, this would affect approximately 5,182 acres of sensitive soils requiring the same environmental protection measures and reclamation as discussed under the Proposed Action. This would more than double the impacts to sensitive soils compared to the Proposed Action.

Of all the alternatives, Alternative B1 would result in the least amount of impacts. Approximately 50 percent, or about 631 acres, of potential additional drilling would occur on sensitive soils, with cumulative impacts affecting about 2,955 acres. This would amount to a 18 percent increase in impacts compared to the Proposed Action. The same environmental protection measures discussed previously would apply.

As above, about 50 percent of the additional development for Alternative B2 would result in impacts to sensitive soils, with cumulative impacts affecting about 4,798 acres. Comparatively, this is a 91 percent increase in impacts to soils relative to the Proposed Action. The same environmental protection measures discussed previously would apply.

For both Alternatives C1 and C2, about 50 percent of the potential additional drilling would impact sensitive soils. Cumulative impacts would affect 3,153 acres and 5,140 acres, respectively. This would be a 26 percent and 105 percent, respectively, increase in impacts compared to the Proposed Action. The same environmental protection measures discussed previously would apply.

Under the No Action alternative, approximately 65 percent of the potential additional drilling would impact sensitive soils. Cumulative impacts would affect 1,940 acres which would be an 23 percent decrease in impacts compared to the Proposed Action. The same environmental protection measures discussed previously would apply.

Ferron Fairway. Development of the CBM gas reserves of the Ferron Fairway would result in at least 15,020 acres of additional disturbance in the proposed EIS Project Area. Soils throughout the Ferron Fairway are similar to those described in Section 3.4. The southern half of the Fairway has soils similar to those previously described for Emery County. A soil survey is not available for the portion of the Fairway that lies within the Manti La Sal National Forest. However, and

shale outcrops natural landscape features such as relief and drainage patterns suggest that much of the southwestern portion of the Ferron Fairway has soils similar to those described for the Rock Land-Shaly Colluvial Land-Castle Valley-Kenilworth association (USDA, SCS 1970). Very steep to perpendicular sandstone with little to no soil material make up about 60 percent of the association. Shallow to deep soils on gently sloping to steep benches make up the other 40 percent. The susceptibility of these soils to erosion is moderate to high, and they are not saline. Construction and development of a CBM project on the Ferron Fairway could be expected to have impacts to the soils resource similar to those described for the Proposed Action, and erosion control measures would be necessary to minimize soil loss and sedimentation.

Questar Pipeline System. Construction of a pipeline linking all of the CBM projects in the Ferron Fairway would disturb approximately 640 acres. Short-term impacts to the soils resource would, again, be similar to those described for the Proposed Action. Mitigation measures to control erosion, as described for the Proposed Action, should be implemented for any new project in the area.

__Cumulative Assessment__

Should all of the proposed and reasonable foreseeable projects be developed, 18,683 to 21,305 acres of the soils resource would be impacted. Though these are not all necessarily sensitive soils, a high percentage of soils in this region are susceptible to erosion, and in fact, many areas are currently undergoing a high rate of accelerated erosion. Soils in this region also tend to be saline. Impacts would include the loss of top soil, rill and gully development, and increased sediment and salt loads of stream channels and rivers as a result of erosion. The rigorous implementation of erosion control measures and effective reclamation efforts would minimize potential impacts to soils, and would bring erosion and salt delivery rates to within the range of natural rates for the Project Area.

Development of all of these projects would not be likely to result in significant cumulative effects to regional soils. The majority of the Ferron Fairway is federal land, and will be subject to requirements for erosion control and revegetation similar to those applied to the Price CBM Project and described in this EIS. In addition, the projects would affect a relatively small portion of the land within the area, and impacts would be dispersed throughout the area. For example, the RGC Proposed Action would affect only about 2.1 percent of the soils in the EIS Project Area. The Additional Drilling/ Proposed Action alternative would occur within the boundaries of the EIS Project Area, and would affect an additional 0.8 percent, or about 2.9 percent total. Development of CBM resources in all parts of the Ferron Fairway would affect about 18,683 to 21,305 acres of soils, but would occur over an area of over 600,000 acres. Over the entire Ferron Fairway, the ongoing, proposed, and potential projects would therefore affect about 3 to 3.5 percent of the area.

5.3.4 Wildlife

The primary cumulative impacts of concern are loss and fragmentation of big game habitat, primarily from displacement and loss of habitat value. Projects evaluated for cumulative impacts on wildlife include other CBM projects, new coal mines, community expansion, and logging.

The projects would affect several different deer and elk herd units, as shown in Table

5.3.4-1. The different herd units include different summer and winter ranges, and there would likely be only limited intermingling between different herds. Therefore, projects in one herd unit would be unlikely to have adverse cumulative effects on the same animals or populations.

For the Northeast Manti Mule Deer, the Additional Drilling/Proposed Action alternative would affect an estimated 25 percent more critical winter habitat and about 30 percent more high value winter habitat, assuming that the additional drilling overlapped in time with the Price CBM Project. This would increase the area of reduced habitat value in mule deer winter habitat to about 24 percent of the critical winter habitat in the study area and 28 percent of the high value winter habitat. Additional Drilling/Alternative A would similarly increase impacts to about 30 percent of critical winter habitat and 35 percent of high value winter habitat. Since the Price CBM study area makes up a large portion of the Northeast Manti winter range, these impacts would reduce overall winter carrying capacity, and cause proportionate decreases in the mule deer population. Impacts from additional drilling under the Additional Drilling/Critical Areas Avoidance, Additional Drilling/ Security Areas Protection, and No Action alternatives would have similar effects, but would be lower in magnitude. These alternatives would provide secure areas where wintering elk and other wildlife would not be disturbed. Under the Additional Drilling/ Proposed Action and Additional Drilling/ Alternative A alternatives, development would occur throughout the winter habitat.

The Ferron Fairway within the Northeast Manti deer herd unit largely overlaps with the EIS Project Area, except in higher elevation areas west of Hiawatha and near Helper. This additional development would mostly occur in mule deer summer range. Summer habitat is not limiting for the Northeast Manti herd, and development of these areas would therefore have minor cumulative impacts in conjunction with the Price CBM Project. Migration routes from summer to winter habitat could be adversely affected.

The other projects within the Northeast Manti deer herd unit would also have minor cumulative effects with the Price CBM Project. Only a small portion of the potential Questar pipeline would be located within this herd unit. The most likely location along Highway 10 is in limited value yearlong habitat, which is unlikely to adversely affect deer populations. In addition, impacts would be short-term. The Blue Blaze coal mine would involve minor surface disturbance in summer habitat, and is located on an existing access road. The several community developments within this herd unit are located in limited value yearlong habitat, and would affect relatively small areas. Logging projects at the higher elevations within this herd unit would affect summer habitat. Deer would be displaced from these area during logging, but could be attracted to it during forest regeneration. Logging projects would be unlikely to adversely affect mule deer populations in the herd unit.

For the Manti elk herd, the Additional Drilling/Proposed Action and Additional Drilling/Alternative A would affect a minor amount of critical winter habitat, and about 80 percent more high value winter habitat than the corresponding EIS alternative. This would result in additional reduction in the elk winter habitat carrying capacity and a corresponding reduction in population, assuming that additional drilling overlapped in time with the Price CBM Project. Impacts would be lower for the other additional drilling alternatives,

which would each provide secure areas undisturbed by development. The Grimes Wash and Buzzard Bench projects are also located in elk winter habitat within the Manti herd unit, and would have adverse effects. The Price CBM project, additional drilling and the other CBM projects would cause cumulative significant losses in population from loss of winter habitat in the Manti elk herd.

The Ferron Fairway largely overlaps with the EIS Project Area in the northern portion of the Manti elk herd unit, but extends as a 10- mile wide band south for another 35 to 45 miles within the unit. CBM development would occupy a large portion of the elk critical and high value winter habitat for the herd unit. Elk may be displaced to agricultural areas and winter range for other herd units, and elk populations in the herd unit are likely to greatly decrease.

The other projects within the Manti elk herd unit would have minor cumulative effects with the Price CBM Project. The potential Questar pipeline would be located within this herd unit, most likely along Highway 10. Pipeline construction along Highway 10 would be unlikely to adversely affect elk populations, and impacts would be short-term. The Blue Blaze coal mine would involve minor surface disturbance in summer habitat, and is located on an existing access road. The several community developments within this herd unit are located in limited value winter habitat, and would have minor or no cumulative impacts. Logging projects at the higher elevations within this herd unit would displace elk during logging activities, and may adversely affect summer habitat or migration corridors.

The additional drilling alternatives would also increase impacts to pronghorn antelope, black bear, moose, and mountain lion within the study area. Impacts to pronghorn antelope would be doubled for all additional drilling alternatives, and the other species would be displaced from much of their habitat in the EIS Project Area. Development of the Ferron Fairway would likely cause significant reductions in black bear and mountain lion along the eastern side of the Wasatch Plateau. Other projects would have minor cumulative impacts.

The other deer and elk herds listed in Table 5.3.4-1 would be unlikely to receive cumulative impacts directly relating to the Price CBM Project. However, development of the Ferron Fairway and the additional drilling alternatives would be likely to result in significant impacts in these herd units, and the projects may generate cumulative impacts among themselves. Additive losses among different herds may be sizable, and result in significant reductions in big game populations, habitat carrying capacity, and hunting opportunities.

5.3.5 Recreation

Cumulative impacts to open space would primarily affect the dispersed recreational opportunities and quality of recreational experiences possible on public lands within 30 to 45 minutes of Price and surrounding areas. The cumulative effects of the identified ongoing, proposed, potential and other projects would noticeably diminish the availability and aesthetic quality of public lands that are used for hunting, horseback riding, off-road vehicles, wildlife viewing, hiking and mountain biking. Impacts would be particularly evident between Price and Kenilworth, where a variety of informal recreational activities occur on a regular basis. The Carbon County Trails Plan identifies the Wood Hill-Kenilworth loop trail as a trail system that is currently widely used by recreationists from the local communities.

The attractiveness of this area for recreational development would be substantially reduced by the Helper-Price CBM Project. A pilot project in this area resulted in the drilling of four CBM wells and one water disposal well.

The proposed Helper-Price project would develop an additional 64 CBM wells in this area, impacting the scenic quality, and generating dust, noise, and traffic impacts, especially during the construction phase of the project. Cumulative impacts on lands available for hunting would substantially increase competition amongst hunters in remaining areas to the east of Price.

5.3.6 Visual Resources

The cumulative impacts that could result from multiple project developments in the region and full buildout of the EIS Project Area would entail significant changes to natural landscape qualities and substantially affect the quality of views currently available to residents and visitors. Cumulative scenarios considered in this EIS for the Project Area are shown on Plates 28 through 34. Tables 5.2-1 through 5.2-7 identify the amount of disturbance expected with each alternative. Plates 26 and 27 shows the relationship of the Project Area to other potential projects.

Landscape Character

Cumulative impacts to natural landscape character and scenic quality could result from the buildout of the EIS Project Area and other projects shown on Plates 26 and 27. Cumulative impacts to landscape character would primarily occur in areas where the CBM facilities would coexist with other types of industrial developments. Due to the low profile and density of facilities associated with CBM development, cumulative impacts to landscape character would largely be limited geographically to the EIS Project Area and adjacent landscapes. Within this area, proposed and potential projects that would further change the character of the landscape of the EIS Project Area include the buildout of the EIS Project Area (i.e., additional drilling) and the proposed Helper-Price CBM Project and Helper CBM Pilot Project. Cumulative impacts would be most significant in the vicinity of Price and Kenilworth, where buildout of the CBM facilities in conjunction with the Helper Price CBM Project would effectively transform the existing natural open landscapes to an industrial character. Due to the proximity of these natural public landscapes to these communities, and their use for a variety of open space dispersed recreational purposes, the visual impacts to landscape character are considered significant and potentially unmitigable. Additional drilling in the CBM Project Area and associated activities would similarly have a cumulative impact on landscape quality and character. Cumulative impacts would be significant in the eastern part of the EIS Project Area that provides wide-open and panoramic views of the surrounding landscape. Within this type of open landscape setting, the potential additional drilling in the EIS Project Area would create a highly industrial landscape due to its geographic extent and the influences on truck traffic, dust and noise, as well as the facilities.

In summary, on a regional level, cumulative impacts to landscape character and scenic quality would result in extensive changes to the landscapes directly affected by each of the proposed and potential projects. Impacts would be localized for each proposed project, however. Within the EIS Project Area, cumulative impacts to landscape character and quality are considered to be potentially significant due to the large geographic areas that would be transformed to an industrial

landscape. More remote proposed and potential projects, outside the EIS Project Area, would contribute to the regional loss of natural landscape values, but would not directly interact with effects caused by CBM developments within the EIS Project Area.

<u>Visual Impacts to Viewers</u>

Cumulative impacts to viewers will depend upon the degree to which the various proposed and potential projects may visually interact due to viewshed conditions created by topography and vegetation; and the degree to which different viewer groups may be affected, given their activities and location within the EIS Project Area. Table 5.3.6-1 is a summary comparison of the cumulative alternatives with respect to viewer impacts. Differences among the CBM cumulative alternatives are incremental, or a matter of degree, with all alternatives resulting in significant regional aesthetic impacts. The following summarizes the overall cumulative impacts to various viewer groups.

Local Communities. The communities of Price, Spring Glen/Carbonville, Elmo, and Wellington would be affected primarily along residential edges and/or on higher elevations where open and elevated views towards the cumulative project developments occur. Rural and dispersed residential areas, including the 7 proposed subdivisions, and dispersed residences along Gordon Creek Road, and areas south and west of Price and west of Elmo would be affected. In these areas, foreground and middleground views would be transformed from agricultural or natural open space settings to views of semi-industrial landscapes. These impacts would be significant for all the cumulative alternatives, but greater for Alternatives A, B2, and C2 which would permit 80-acre well spacing, rather than 160-acre well spacing. The significance of impacts would result from the presence of roads, truck traffic, operating wells, and the related loss of views to natural landscapes and wildlife. These types of impacts would also result in any other residential areas that are within the foreground to middleground distance zones of CBM facilities and activities.

Recreation Areas. Cumulative visual impacts to developed and dispersed recreation areas would result from additional CBM drilling and from the Helper-Price CBM Project and Helper CBM Pilot Project. Public lands, currently existing and within view of the recreational trails north of Price and trails included in the County's trails plan, provide aesthetic landscape qualities, serenity, and wildlife viewing opportunities that would be displaced or significantly altered by the cumulative EIS project developments. Under the cumulative project scenarios, the views from, and quality of experiences afforded in, these natural landscape areas would be lost long-term.

Roadways. Travelers along State Highway 6/191 and Highway 10 would experience cumulative visual impacts from project developments shown on Plates 26 and 27. Travelers along Highway 6/191 include both local residents and visitors traveling through the region. Travelers would have foreground views to additional drilling from CBM development, the Helper-Price CBM Project, Matt's Summit CBM Exploration Project and potential middleground to background views to the Proposed Horse Canyon Coal Mine, the B Canyon Coal Mine and the Dugout Canyon Mine. Views along this roadway are currently predominantly natural landscapes, with industrial power plants and related facilities periodically within middleground to background views. Overall, the cumulative visual impacts from the various alternatives would be to substantially increase the

industrial character of roadside views throughout the EIS Project Area. Visual changes to roadside views would potentially have a significant adverse impact on the visual image of the region as viewed by visitors.

Highway 10 is predominantly used as a local thoroughfare between Price and Castle Dale. Cumulative visual impacts could result on travelers from development in the Ferron Fairway, additional CBM drilling, the Hunter Power Plant, the Grimes Wash CBM Pilot Project, and the Buzzard Bench Project. These projects would be within foreground to middleground distance zones and would effectively alter the natural scenic qualities of the landscape to industrial views.

5.3.7 Socioeconomics

5.3.7.1 Cumulative Assessment with Proposed Action

Employment and Earnings

The discussion of cumulative employment and earnings that would be generated by the Proposed Action, plus the other ongoing, proposed, and potential CBM projects in the study area is based on a general assessment of the proportional increase in the number of CBM wells that would be developed. Since it is unclear what the timing and duration of development would be for the potential CBM projects, which are massive in scale, quantitative estimates of new jobs and earnings that would be created in the study area for given years were not calculated. The presentation of potential cumulative impacts, based on proportional increase in CBM wells, includes many assumptions that could influence its accuracy. In particular, this approach assumes construction techniques, labor demands, and costs for all of the cumulative CBM projects would be similar.

With respect to direct employment, the cumulative effect of development of the Proposed Action (601 wells), along with the ongoing projects (153 wells), proposed Helper project (64 wells), potential additional wells in the EIS Project Area (429 wells), and the potential development of the Ferron Fairway (2,800 wells), would be the creation of over a thousand new construction and CBM field jobs over the next thirty years. Given that development of the 601 new CBM wells associated with the Proposed Action alone would employ about 214 workers at project peak, the cumulative development scenario could require about 1,450 workers to construct, operate, and reclaim the 4,000-well cumulative development, assuming employment for the other projects would be proportional to the Proposed Action.

The cumulative CBM projects would employ local workers on a seasonal (construction) and year round basis (CBM field operation and maintenance), and non-local oil and gas workers on a seasonal basis to drill and complete wells. In addition, the potential development of the five coal mining projects, construction of the new interconnect pipeline, and construction of housing (community expansion projects), would create hundreds of additional jobs for skilled workers in Carbon and Emery Counties. In general, this massive cumulative creation of new jobs for construction workers, gas field workers, and coal miners would result in a shortage of workers in those economic sectors. Virtually anyone residing in Carbon and Emery Counties possessing the proper skills, who wanted to work, could obtain employment on one of those projects. It is likely that workers that are currently underemployed (former coal miners and power plant workers), working in

lower wage service and retail trade jobs, would take higher wage employment with a CBM or coal mining operations, thereby resulting in a potential shortage of service and trade sector workers as well. Given the massive scale of the cumulative CBM projects, and the potential shortage of qualified workers, it is possible that project proponents would have to recruit workers from outside of the project area to staff these projects. It is unclear what the magnitude of this inmigration of workers and their families would be, however.

Similarly, cumulative direct project earnings would increase substantially beyond those generated by the Proposed Action. Given that the Proposed Action would generate about $3.7 million in earnings during its peak year (1996 dollars), the cumulative development of about 4,000 CBM wells, five coal mines, a pipeline project, and additional housing development, would likely generate earnings in the $10 - 20 million range annually.

As described previously in Section 4.15, economic benefits would also occur as a result of purchases of equipment and supplies for CBM development from local area vendors (indirect economic impacts) and expenditure of CBM and other project earnings on housing, food, and goods and services provided by study area businesses (induced economic impacts). Estimates of the indirect and induced economic benefits that would be generated by the cumulative projects have not been modeled for this analysis, so specific projections of employment and earnings that would be generated have not been calculated.

In general, the direct employment of as many as 1,450 additional workers on CBM projects in the study area and expenditure of associated earnings in the local economy, as well as purchasing activity by CBM projects, would likely result in the creation of numerous jobs and earnings in Carbon and Emery Counties. These would primarily consist of service and trade sector jobs, with additional jobs created in finance, insurance, and real estate, as well as transportation and public utilities. These new jobs indirectly created and induced by the Proposed Action would comprise both expansion of existing businesses and creation of new businesses.

As the various CBM projects neared their completion, employment would decline and laid off workers would return to lower paying service and trade sector jobs, retire, or leave the study area in pursuit of other employment opportunities. Given the massive scale of the cumulative development of CBM, coal mining, and other projects, it is possible that, should most of these projects reach completion in a similar timeframe, that large scale unemployment and an economic downturn could occur in the study area. Similarly, the reduction in direct CBM employment and earnings would indirectly result in a reduction of service and trade sector jobs and earnings.

Population, Housing, and Community Facilities and Services

As described previously, the large scale increase in skilled employment that the cumulative group of projects would generate is likely to result in the full employment of qualified local area residents, as well as the inmigration of workers from outside of Carbon and Emery Counties to staff them. To the extent the projects would result in the inmigration of year round workers and their families, the populations of Carbon and Emery Counties would increase. This population increase would result in an increase in demand for housing and various community facilities and services.

As described in Section 3.15, vacancy rates for housing in the study area are presently a low 4% in both Carbon and Emery Counties. To the extent the cumulative projects result in the inmigration of substantial numbers of year round residents, the shortage of permanent housing would be further exacerbated and negative impacts would be experienced by residents unable to find suitable housing they could afford. In an effort to increase the supply of housing in the local area, Carbon County has recently modified its zoning ordinance to permit the construction of more affordable modular housing units in many parts of the county. Accordingly, the Carbon County Planning Department has observed a recent increase in the construction of these housing units within the county. It is also important to note that part of the cumulative project scenario includes the development of proposed subdivisions in the project area. In total, about 88 lots would be developed, thereby increasing the supply of housing in the project area. Although these subdivisions would generally feature houses in the higher price ranges, it is likely that many units would be purchased by local residents “moving up” in the market, who would be vacating more moderately priced homes.

The use of substantial numbers of non-local seasonal construction workers for the various CBM projects would significantly increase the demand for temporary housing, such as motel rooms, mobile home sites and RV campsites.

Another important issues associated with the potential inmigration of workers and their families would be the potential increase in demand on public schools in the project area. As described in Section 3.15, with the exception of East Carbon, public schools in Carbon County are nearing capacity at all grade levels. In Emery County, the elementary school grade levels have room for additional students, while the middle and high schools at or above capacity. The potential for inmigration of year round workers and their families therefore has the potential to negatively impact local school districts to the extent overcrowding would result. In response to potential school overcrowding, the school districts would have to expand facilities to accommodate the additional students. From a fiscal standpoint, the development of the potential cumulative CBM projects and coal mines would substantially increase assessed value in both counties, thereby increasing ad valorem tax revenues both counties would receive. Since the county school districts receive the largest share of ad valorem tax revenue, it is likely that the development of the cumulative projects would mitigate their own impact of increased school enrollment to a large extent. Additional information on cumulative ad valorem tax revenue is presented in the following section.

Costs and Benefits of the Proposed Project and Local Government Fiscal Conditions

In terms of actual financial costs to the local governments of the study area, the most important potential project-related impacts concern the use of county roads for access to potential CBM project locations, and increased demands on public schools due to project-related population growth and increased enrollment. Other potential costs could include expansion of infrastructure, such as water supply, wastewater treatment, and parks and recreational facilities, and expansion of law enforcement and fire protection services to serve potential population growth in the study area. From a fiscal benefits perspective, the cumulative CBM and coal mining projects would generate substantial mineral royalties and various types of tax revenue for local governments and the State of Utah.

Cost of County Road Maintenance

For the Proposed Action and other cumulative projects, access to considerable portions of the CBM development area from state and federal highways would require the use of county roads and could increase maintenance costs borne by the special districts. Discussions with the Carbon County Roads Special Service District have revealed that royalty payments from the proposed CBM projects would more than compensate for any increased maintenance costs the County may have to bear in the future. Similar beneficial fiscal impacts are anticipated for the Emery County Special Service District #1.

Cost of Increased Enrollment in Public Schools

Based on very preliminary estimates of the labor demands of the cumulative CBM and coal mining projects, it is possible that a substantial inmigration of workers into Carbon and Emery Counties would occur over the next twenty to thirty years, thereby increasing the number of school age children in the study area. Since public schools in both Carbon and Emery Counties are currently at or near capacity at many grade levels, it is possible that the school districts in both counties may have to expand their facilities and hire more staff to handle this potential growth, or implement busing programs to transport students from overcrowded schools to schools operating below capacity. Since it is unclear what the timing and magnitude of potential population growth would be, the extent of the increase in demand on public schools and associated costs to the county school districts is unknown at this time.

The Permanent Community Impact Fund

As described in Section 3.15, an important source of revenue that would be contributed by the cumulative CBM and coal mining projects, that is related to mineral royalty payments, is the Permanent Community Impact Fund (PCIF), which is administered by the State of Utah. Royalty payments from the cumulative CBM and coal mining projects would contribute tens of millions of dollars to the PCIF over their lives, which would result in beneficial impacts for cities that would receive PCIF funds within the study area, as well as in other parts of Utah. Over the long-term, communities in Carbon and Emery Counties would be eligible for millions of dollars in grants and loans from the PCIF to fund a variety of infrastructure projects and other community facilities, such as roads, sewer projects, educational institutions, and recreational facilities they would need to accommodate potential future growth.

State Mineral Royalties and Taxes

Mineral lease payments are also collected by the State of Utah for wells producing on state lands. In 1995, state royalty payments associated with RGC CBM wells amounted to $1.74 million. Over the life of the proposed project and other cumulative projects, these payments would increase each year until the projects reach full production. This revenue would be paid into both the State School Trust and the Utah General Fund; the amounts allocated would be based on the types of state lands leased. Severance and Conservation taxes on gas produced by the proposed project would also contribute revenue to the state government. It is estimated that these tax payments associated with proposed wells would be $300,000 for RGC alone in 1996 and would increase during the construction phase of the project due to increases in

production. Over time, as production would decline, this source of revenue would also decline.

Local Ad Valorem Tax Revenue

With respect to the cities and counties of the study area, another important source of revenue that would be generated by the proposed project would be ad valorem tax that would be levied on improvements constructed by RGC and the other companies in the cumulative impact study area. These revenues would be used by the county to fund a variety of services and facilities. The Carbon and Emery County School Districts would receive largest portion of county ad valorem tax revenue. Over time, as the number of wells and improvements were increased, ad valorem taxes would increase correspondingly. As described in Section 4.15, estimated ad valorem tax revenue that would be generated by RGC alone (601 new CBM wells) would be $11.62 million for Carbon County, and $1.5 million for Emery County. With the development of a cumulative total of about 4,000 wells, plus the five coal mining projects, the pipeline, and additional housing, it is likely that the cumulative project development would generate several tens of millions of dollars in additional ad valorem tax revenue for the two county study area.

These increased revenues could be used by the counties for expanding and/or improving public schools, as well as other communities facilities and services. In general, this increase in revenue would help to mitigate the increase in demand for community facilities and services generated by increased population associated with inmigration of cumulative CBM project workers.

Sales and Use Tax Revenue

Purchasing activity by RGC and the other CBM companies would generate sales and use tax revenue for the cities and counties of the study area and the State of Utah. Although precise purchasing amounts are not available for all of the potential CBM projects, it is estimated that purchasing activity in the local area would generate many tens of thousands of sales tax dollars for state and local governments. Local governments in turn would use this tax revenue for providing services and operating community facilities, thereby benefiting local area residents, or at least helping to accommodate new residents who relocate to the project area to staff the various CBM and mining projects.

In summary, the cumulative projects would increase many of the costs borne by cities and counties in the study area of maintaining and upgrading community facilities and services due to potential population growth and increased use of county roads for access to CBM developments and coal mining projects. On the other hand, since most of the projects considered for cumulative impacts would generate substantial mineral royalties (payments to county road districts, PCIF funds) and ad valorem tax revenue (school districts, water districts, county general funds), it is likely that the cumulative projects would mitigate their own fiscal impacts to a large extent. Given the considerable uncertainties associated with the timing and magnitude of the various projects, it is unclear at his time whether the cumulative projects would result in a fiscal net benefit or cost for the cities and counties of the study area.

Estimating the Economic and Quality of Life Costs Associated With the Degradation of Outdoor Recreational Opportunities

Impacts to hunting and other outdoor recreation opportunities would be similar in nature to those described for the Proposed Action in Section 4.15, but would be considerably greater in magnitude and geographic extent, due to greater disturbance of game habitat and areas used for outdoor recreation. Under the cumulative impact scenario, not only would the EIS Project Area be completely developed with RGC and additional wells, other projects would impact areas suitable for hunting and recreation from north of Helper City all the way south to about Interstate 70 in Emery County, due to potential CBM development of the entire Ferron Fairway (Plates 26 and 27).

At this time, elk and deer population data, as well as habitat areas, have not been identified for the total cumulative impact study area. As a result, estimates of reduced elk and deer hunting have not been calculated and the associated loss of economic activity are not available. Since the total area impacted would be considerably greater, it is assumed that the cumulative impact to hunting would exceed the $346,000 impact projected for the Proposed Action alone.

With respect to outdoor recreation, impacts associated with reduced or degraded recreational opportunities to local area residents would be considerably greater than described for the Proposed Action, due to the increased number and greater geographic distribution of CBM wells, and related visual and truck-related disturbance.

Potential Adverse Impacts of an Economic Boom-Bust Cycle

The analysis of the potential for the cumulative development of CBM and coal mining projects to cause to an economic boom-bust cycle in Carbon and Emery Counties must place the projects in the context of the overall study area economy. To accomplish this, estimated cumulative project employment figures were compared with 1996 employment figures provided by the Utah Department of Employment Security for the mining sector (which includes oil and gas employment), construction sector, and total non-farm employment for the study area to identify the extent to which employment would change as a result of those projects.

As described previously, the cumulative CBM projects alone could result in a net increase of as many as 1,450 total new jobs for the study area at their peak, with a period of layoffs and declining employment in the years following. Assuming the breakdown of job types would be similar to the Price CBM Project, about 29% (up to 427 jobs) of these positions would be local construction industry jobs, 32% (up to 461 jobs) would be local year round gas field jobs, and 39% (up to 562 jobs) would be specialized drilling and completion jobs occupied by non-local contractors.

For the local jobs, the addition and then loss of about 427 construction sector jobs would represent about a 96% net change in that employment sector for Carbon and Emery Counties combined, based on 1996 employment data (Utah Department of Employment Security 1996). Similarly, since CBM jobs are counted as part of the mining industry, the addition and then loss of about 461 CBM jobs would represent about a 24% net change in the mining employment sector. When the five potential coal mining projects,

with about 300 new mining jobs, are added to this analysis, there would be a net change of about 40% in the mining sector. For the economy as a whole, the addition and loss of 1,180 new local resident jobs would equate to a net change of 9.8% of total nonfarm employment in Carbon and Emery Counties, based on 1996 total employment figures. If indirect and induced employment that would be generated by the cumulative projects were added, this employment impact would be even larger. Clearly, the cumulative employment impacts to Carbon and Emery Counties would be significant in the context of the current economy. It is expected that cumulative earnings associated with the various project would have similar significance in the context of the current local economy as well. It is important to note that project-related gains and losses in employment are compared with 1996 employment values, which may be considerably different than actual employment values in the future. Actual percentages of jobs gained and lost in their respective industries and compared to the economy as a whole would ultimately depend on their actual size in the future.

Another important consideration with respect to a potential boom-bust cycle in the local economy is the timing of the various projects. The analysis above was based on an assumption that all of the potential cumulative projects would occur and their employment would peak at the same time. However, if timing of the projects were staggered to some extent, the impact on the overall economy would be attenuated, that is, employees laid off at the completion of earlier projects would be hired to staff later projects. To the extent these projects were spread out over time, the less likely an economic boom-bust cycle would occur.

Quality of Life Issues

For those in the study area who strongly value outdoor recreation experiences, such as mountain biking and wildlife viewing, the cumulative project scenario would degrade the quality of life for those individuals. Similarly, individuals that would find the sight of CBM facilities and wells in open space areas unattractive may also feel the project would have adverse impacts on their quality of life. It is very important to consider that CBM development under the cumulative impact scenario would virtually surround the Cities of Price and Wellington, and nearby communities in Carbon County with CBM development (Plate 28). Furthermore, with the development of the Grimes Wash and Buzzard's Bench projects, as well as the entire Ferron Fairway, virtually all of the communities in Emery County along the Highway 10 corridor would also experience similar impacts (Plates 26 and 27). Local area residents who would not want to recreate in CBM developed areas would have to travel to alternative locations, often many miles away to find undeveloped public land for activities such as biking and wildlife observation.

RGC and the other gas companies would implement mitigation measures that would reduce visual impacts, such as painting CBM facilities colors that blend well with the surroundings. In addition, the maintenance of clean working areas would minimize unsightly debris. These measures would help to reduce potential impacts to the attractiveness of the study area and associated quality of life, although recreational users of the CBM development areas may experience visual impacts that can not be fully mitigated (see Section 5.3.6).

Alternatively, the study area has a long history of mining and natural resources extraction and

production. Many residents in the study area currently derive their livelihoods from coal mining, coalbed methane, and power plant operations. In general, the fact that employment in these industries provides higher wages and is the economic base of the region is well understood in the communities of the study area. Unlike other areas where a new mine or natural gas development would cause significant changes in the composition and character of local communities, the cumulative CBM and coal mining projects would be compatible with industries that have been established in the study area for many decades.

For individuals that would be employed directly or indirectly, the project may have beneficial impacts on quality of life, due to increased economic opportunity. In general, wages that would be paid to project workers would be higher than many of the wages paid to service and trade sector workers in the study area. In addition, to the extent the proposed project provides additional tax revenue and royalty income to various local government entities and increases the funding of important community facilities, such as libraries and parks, the project could have beneficial impacts on the quality of life in the study area.

5.3.7.2 Cumulative Assessment with Alternatives A, B2, and C2

In general, cumulative impacts under the various project alternatives would be similar in nature to those described above for the Proposed Action. Differences in alternatives relate to well spacing and exclusion from sensitive wildlife habitat areas in the Price CBM area only. Since development of the Ferron Fairway, other CBM projects, and the coal mining project would not change under these alternatives, there is little or no difference in cumulative impacts for these areas.

For Alternatives A, B2, and C2, which increase well density due to 80-acre spacing, cumulative employment and earnings would be greater than described under the Proposed Action. Accordingly, population growth would also be greater, resulting in an increase in demand on housing and community facilities and services. These alternatives would also increase both fiscal costs and benefits to cities and counties in the study area due to increased demands placed on county roads and community facilities and services, but also increased payment of royalties and taxes which would help pay for those increased costs. With respect to hunting and informal outdoor recreation, the greater density of CBM well development in the Price CBM area would make that area even less appealing for hunting and informal recreation. The potential for an economic boom-bust cycle would also be greater for these alternatives than described under the Proposed Action, due to their larger scale and associated larger gains and losses of employment and earnings. Quality of Life issues for Alternatives A, B2, and C2 would generally be the same as those described for the Proposed Action, although the greater magnitude of the cumulative impacts would mean greater negative impacts on those opposed to CBM development, but greater positive impacts to those who value increased economic opportunity.

5.3.7.3 Cumulative Assessment with Alternatives B1, C1, and the No Action Alternative

For Alternatives B1, C1 and the No Action alternative, which reduce CBM development in the EIS Project Area relative to the Proposed Action, cumulative employment and earnings would be smaller than described under the

Proposed Action. Accordingly, population growth would also be smaller, resulting in a smaller increase in demand on housing and community facilities and services. These alternatives would also decrease both fiscal costs and benefits to cities and counties in the study area due to decreased demands placed on county roads and community facilities and services, but also decreased payment of royalties and taxes. With respect to hunting and informal outdoor recreation, the exclusion of CBM well development from sensitive wildlife habitats, or federal lands entirely, would reduce impacts to hunters and local area residents who value outdoor recreational opportunities in those locations. The potential for an economic boom-bust cycle would also be reduced for these alternatives, compared with the Proposed Action, due to their reduced scale and associated smaller gains and losses of employment and earnings. Quality of Life issues for Alternatives B1, C1, and the No Action alternative would generally be the same as those described for the Proposed Action, although the smaller magnitude of the cumulative projects would mean reduced impacts on those opposed to CBM development, and smaller benefits to those who value increased economic opportunity.

Chapter 5.0
Tables

Chapter 6.0

TABLE 5.1-1
PAST OR ONGOING PROJECTS CONSIDERED PART OF THE AFFECTED ENVIRONMENT AND NOT ANALYZED FOR ADDITIONAL CUMULATIVE IMPACT

Project/Activity	Resources Affected	Change Agents
Municipalities	Surface/ground quantity Surface water quality	Consumptive use Effluent discharge Storm water runoff
	Air quality	Point and non-point combustion emissions
	Wildlife	Habitat alternation
	Visual resources	Structures, transportation systems, lighting
	Socioeconomics/quality of life	Business environment, housing, community infrastructure.
Farming	Surface water quantity and quality	Consumptive use and irrigation return flows
	Air quality	Fugitive dust, burning of fields and ditches
	Wildlife	Habitat alteration, exotic species, pesticides
	Socioeconomics	Employment, sales and purchases
Transbasin diversions	Water quantity	Water diversion from Price/San Rafael River drainages
Livestock grazing	Water quantity Water quality	Consumptive use Sedimentation, bacterial contamination
	Soils	Compaction, cover removal, erosion
	Vegetation	Herbivory Introduction of exotic plants and weeds

TABLE 5.1-1
PAST OR ONGOING PROJECTS CONSIDERED PART OF THE AFFECTED ENVIRONMENT AND NOT ANALYZED FOR ADDITIONAL CUMULATIVE IMPACT

Project/Activity	Resources Affected	Change Agents
	Riparian	Disturbance, habitat alteration
	Wildlife	Habitat alteration, forage competition Predator control Developments and facilities
	Visual resources	Landscape alteration, facilities
	Socioeconomics	Purchases and sales
Transportation systems includes roads, railroads, transmission lines and pipelines	Air quality	Vehicle emissions
	Soils	Disturbance, drainage alteration
	Wildlife	Habitat fragmentation
	Visual resources	Structures, alignments
	Socioeconomics	Commerce
Existing power plants	Water quantity	Consumptive use
	Air quality	Stack emissions
	Visual resources	Facilities, decreased visual range
	Socioeconomics	Employment, purchases, revenue to counties
Recreation	Wildlife	Hunting, direct disturbance of animals
	Livestock	Disruption of operations
	Visual resources	Vehicle tracking off road

TABLE 5.1-1

PAST OR ONGOING PROJECTS CONSIDERED PART OF THE AFFECTED ENVIRONMENT AND NOT ANALYZED FOR ADDITIONAL CUMULATIVE IMPACT

Project/Activity	Resources Affected	Change Agents
	Cultural resources	Site disturbance
	Socioeconomics	Local expenditures, business opportunity
East Carbon Landfill	Air quality	Fugitive dust, emissions
	Visual resources	Landscape alteration
	Socioeconomics	Employment, revenue to Carbon Co.
Forestry includes logging on private lands and sawmill operations at Wellington	Air quality	Emissions
	Water quality	Increased sedimentation
	Wildlife	Habitat alteration, displacement
	Visual resources	Changes in landscape character
Existing coal mines includes load out and waste rock facilities Cyprus-Plateau, Deer Creek, Andalex, Soldier Creek, Sufco, Trail Mountain, Skyline, White Oak, Coop	Ground and surface water	Ground water flow interception
	Wildlife	Habitat fragmentation associated with roads
	Socioeconomics	Employment, service industry, county revenue

TABLE 5.1-2

ONGOING OR REASONABLE, FORESEEABLE FUTURE PROJECTS CONSIDERED AND ANALYZED FOR CUMULATIVE IMPACT

Project/Activity[1]	Resources Affected	Change Agents
Other CBM development Ongoing Projects: Castlegate, Matt's Summit, Helper Pilot Project, Grimes Wash, and Buzzard Bench Proposed Project: Helper Potential Projects: Potential additional drilling in EIS Project Area, Ferron Fairway, and additional Questar pipeline	Water quality and quantity Air quality Soils Wildlife Recreation Visual resources Socioeconomics/quality of life	Consumptive use Coal seam dewatering Emissions Surface disturbance Habitat alteration/fragmentation Industrial development, public land access Visual range, emissions Revenues, costs, alteration of landscape
Proposed/Potential Coal Mines Willow Creek, Dugout Canyon, B Canyon, Blue Blaze, Horse Canyon South	Groundwater/surface water Wildlife Socioeconomics	Groundwater flow interception Habitat fragmentation, road through winter range Employment, revenues

TABLE 5.1-2
ONGOING OR REASONABLE, FORESEEABLE FUTURE PROJECTS CONSIDERED AND ANALYZED FOR CUMULATIVE IMPACT

Project/Activity[1]	Resources Affected	Change Agents
Community Expansion Seven approved but not built subdivisions within the EIS project area near Price	Water quantity Wildlife Visual resources Socioeconomics	Consumptive use Habitat conversion Landscape alteration New Key Observation Points Housing, supply
Future logging of state and private land	Water quality Wildlife Visual resources	Increased sediment Habitat alteration/fragmentation Changes in shape, color, texture
Gooseberry Narrows Dam Proposed Project	Water quantity	Transbasin diversion from Price River drainage

[1] Refer to Plates 26 and 27 for the locations of the projects.

TABLE 5.2-1

POTENTIAL ADDITIONAL DRILLING/EIS PROPOSED ACTION[1]

SOURCES AND EXTENT OF POTENTIAL DISTURBANCE[2]

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
FEDERAL LANDS				
Production Wells[3]	153		216	216
Transportation Corridors[4]		39	319	151
Subtotal			535	367
UDWR LANDS				
Production Wells[3]	30		41	41
Transportation Corridors[4]		7	57	27
Subtotal			98	68
UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS				
Production Wells[3]	64		91	91
Transportation Corridors[4]		18	142	68
Subtotal			233	159
PRIVATE LANDS				
Production Wells[3]	182		252	252
Transportation Corridors[4]		37	307	147
Subtotal			559	399
TOTAL LANDS				
Production Wells[3]	429		600	600
Transportation Corridors[4]		100	825	393
Compressor Sites	4		20	20
Injection Wells	4		28	28
Evaporation Ponds	4		16	16
Grand Total			1,489	1,057

[1] Potential additional drilling in Price CBM Project Area, with RGC Proposed Action - field development with 160-acre well spacing.

[2] Disturbance acreages for compressor sites, injection wells, and evaporation ponds are presented only under Total Lands; locations for these potential facilities are not known.

[3] Assume 1.4-acre well pads.

[4] Assume total ROW width of 77 feet; short-term total disturbance width of 67 feet; long-term disturbance width of 32 feet.

TABLE 5.2-2

POTENTIAL ADDITIONAL DRILLING/EIS ALTERNATIVE A[1]

SOURCES AND EXTENT OF POTENTIAL DISTURBANCE[2]

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
FEDERAL LANDS				
Production Wells[3]	421		589	589
Transportation Corridors[4]		75	620	295
Subtotal			1,209	884
UDWR LANDS				
Production Wells[3]	77		107	107
Transportation Corridors[4]		13	105	50
Subtotal			212	157
UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS				
Production Wells[3]	167		235	235
Transportation Corridors[4]		32	257	123
Subtotal			492	358
PRIVATE LANDS				
Production Wells[3]	435		606	606
Transportation Corridors[4]		67	563	267
Subtotal			1,169	873
TOTAL LANDS				
Production Wells[3]	1,100		1,537	1,537
Resource Roads[4]		187	1,544	734
Compressor Sites	7		35	35
Injection Wells	10		80	80
Evaporation Ponds	10		40	40
Grand Total			3,236	2,426

[1] Potential additional drilling in Price CBM Project Area, with EIS Alternative A - field development with 80-acre well spacing.

[2] Disturbance acreages for compressor sites, injection wells, and evaporation ponds are presented only under Total Lands; locations for these potential facilities are not known.

[3] Assume 1.4-acre well pads.

[4] Assume total ROW width of 77 feet; short-term total disturbance width of 67 feet; long-term disturbance width of 32 feet.

TABLE 5.2-3

POTENTIAL ADDITIONAL DRILLING/EIS ALTERNATIVE B1[1] SOURCES AND EXTENT OF POTENTIAL DISTURBANCE[2]

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
FEDERAL LANDS				
Production Wells[3]	90		126	126
Transportation Corridors[4]		23	193	92
Subtotal			319	218
UDWR LANDS				
Production Wells[3]	28		39	39
Transportation Corridors[4]		7	53	25
Subtotal			92	64
UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS				
Production Wells[3]	63		90	90
Transportation Corridors[4]		18	142	68
Subtotal			232	158
PRIVATE LANDS				
Production Wells[3]	182		253	253
Transportation Corridors[4]		36	298	142
Subtotal			551	395
TOTAL LANDS				
Production Wells[3]	363		508	508
Resource Roads[4]		83	686	327
Compressor Sites	4		20	20
Injection Wells	4		32	32
Evaporation Ponds	4		16	16
Grand Total			1,262	903

[1] Potential additional drilling in Price CBM Project Area, with EIS Alternative B1 - Critical Areas Avoidance with 160-acre well spacing.

[2] Disturbance acreages for compressor sites, injection wells, and evaporation ponds are presented only under Total Lands; locations for these potential facilities are not known.

[3] Assume 1.4-acre well pads.

[4] Assume total ROW width of 77 feet; short-term total disturbance width of 67 feet; long-term disturbance width of 32 feet.

TABLE 5.2-4

POTENTIAL ADDITIONAL DRILLING/EIS ALTERNATIVE B2[1] SOURCES AND EXTENT OF POTENTIAL DISTURBANCE[2]

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
FEDERAL LANDS				
Production Wells[3]	217		303	303
Transportation Corridors[4]		41	336	160
Subtotal			639	463
UDWR LANDS				
Production Wells[3]	73		102	102
Transportation Corridors[4]		12	99	47
Subtotal			201	149
UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS				
Production Wells[3]	166		234	234
Transportation Corridors[4]		31	256	122
Subtotal			490	356
PRIVATE LANDS				
Production Wells[3]	438		611	611
Transportation Corridors[4]		67	561	266
Subtotal			1,172	877
TOTAL LANDS				
Production Wells[3]	894		1,249	1,249
Resource Roads[4]		151	1,252	595
Compressor Sites	6		30	30
Injection Wells	8		64	64
Evaporation Ponds	8		32	32
Grand Total			2,627	1,970

[1] Potential additional drilling in Price CBM Project Area, with EIS Alternative B2 - Critical Areas Avoidance with 80-acre well spacing.

[2] Disturbance acreages for compressor sites, injection wells, and evaporation ponds are presented only under Total Lands; locations for these potential facilities are not known.

[3] Assume 1.4-acre well pads.

[4] Assume total ROW width of 77 feet; short-term total disturbance width of 67 feet; long-term disturbance width of 32 feet.

TABLE 5.2-5

POTENTIAL ADDITIONAL DRILLING/EIS ALTERNATIVE C1[1] SOURCES AND EXTENT OF POTENTIAL DISTURBANCE[2]

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
FEDERAL LANDS				
Production Wells[3]	123		175	175
Transportation Corridors[4]		31	254	120
Subtotal			429	295
UDWR LANDS				
Production Wells[3]	21		29	29
Transportation Corridors[4]		6	48	23
Subtotal			77	52
UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS				
Production Wells[3]	63		89	89
Transportation Corridors[4]		17	137	65
Subtotal			226	154
PRIVATE LANDS				
Production Wells[3]	181		249	249
Transportation Corridors[4]		36	301	144
Subtotal			550	393
TOTAL LANDS				
Production Wells[3]	388		543	543
Transportation Corridors[4]		90	740	352
Compressor Sites	4		20	20
Injection Wells	4		32	32
Evaporation Ponds	4		16	16
Grand Total			1,351	963

[1] Potential additional drilling in Price CBM Project Area, with EIS Alternative C1 - Security Areas Protection with 160-acre well spacing.

[2] Disturbance acreages for compressor sites, injection wells, and evaporation ponds are presented only under Total Lands; locations for these potential facilities are not known.

[3] Assume 1.4-acre well pads.

[4] Assume total ROW width of 77 feet; short-term total disturbance width of 67 feet; long-term disturbance width of 32 feet.

TABLE 5.2-6

POTENTIAL ADDITIONAL DRILLING/EIS ALTERNATIVE C2[1]

SOURCES AND EXTENT OF POTENTIAL DISTURBANCE[2]

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
FEDERAL LANDS				
Production Wells[3]	335		471	471
Transportation Corridors[4]		61	499	237
Subtotal			970	708
UDWR LANDS				
Production Wells[3]	50		70	70
Transportation Corridors[4]		10	79	38
Subtotal			149	108
UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS				
Production Wells[3]	162		228	228
Transportation Corridors[4]		30	246	118
Subtotal			474	346
PRIVATE LANDS				
Production Wells[3]	432		601	601
Transportation Corridors[4]		66	555	263
Subtotal			1,156	864
TOTAL LANDS				
Production Wells[3]	979		1,370	1,370
Transportation Corridors[4]		167	1,380	656
Compressor Sites	6		30	30
Injection Wells	9		72	72
Evaporation Ponds	9		36	36
Grand Total			2,888	2,164

[1] Potential additional drilling in Price CBM Project Area, with EIS Alternative C2 - Security Areas Protection with 80-acre well spacing.

[2] Disturbance acreages for compressor sites, injection wells, and evaporation ponds are presented only under Total Lands; locations for these potential facilities are not known.

[3] Assume 1.4-acre well pads.

[4] Assume total ROW width of 77 feet; short-term total disturbance width of 67 feet; long-term disturbance width of 32 feet.

TABLE 5.2-7

POTENTIAL ADDITIONAL DRILLING/EIS NO ACTION[1] SOURCES AND EXTENT OF POTENTIAL DISTURBANCE[2]

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
FEDERAL LANDS				
Production Wells[3]	11		16	16
Transportation Corridors[4]		3	22	10
Subtotal			38	26
UDWR LANDS				
Production Wells[3]	28		39	39
Transportation Corridors[4]		6	51	24
Subtotal			90	63
UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS				
Production Wells[3]	64		91	91
Transportation Corridors[4]		17	138	66
Subtotal			229	157
PRIVATE LANDS				
Production Wells[3]	182		252	252
Transportation Corridors[4]		35	293	140
Subtotal			545	392
TOTAL LANDS				
Production Wells[3]	285		399	399
Transportation Corridors[4]		61	504	240
Compressor Sites	3		15	15
Injection Wells	2		16	16
Evaporation Ponds	2		8	8
Grand Total			942	678

[1] Potential additional drilling in Price CBM Project Area, with EIS No Action Alternative - No development on federal land except for grants of ROW for access.

[2] Disturbance acreages for compressor sites, injection wells, and evaporation ponds are presented only under Total Lands; locations for these potential facilities are not known.

[3] Assume 1.4-acre well pads.

[4] Assume total ROW width of 77 feet; short-term total disturbance width of 67 feet; long-term disturbance width of 32 feet.

TABLE 5.2-8
ADDITIONAL DRILLING SCENARIOS: FACILITIES RESTRICTED FROM CONSTRUCTION BY BLM RAPTOR NEST AVOIDANCE BUFFER ZONES[1]

				Acres Disturbed	
Alternative	**Facility**	**No.**	**Miles**	**Short-Term**	**Long-Term**
Potential Additional Drilling/Proposed Action - 160-acre Spacing					
	Production Wells	20		28	28
	Transportation Corridors		6	50	65
	Total			78	93
Potential Additional Drilling/Alternative A - 80-acre Spacing					
	Production Wells	48		67	67
	Transportation Corridors		11	91	43
	Total			158	110
Potential Additional Drilling/Alternative B1 - Critical Areas Avoidance - 160-acre Spacing					
	Production Wells	4		6	6
	Transportation Corridors		1	10	5
	Total			16	11
Potential Additional Drilling/Alternative B2 - Critical Acres Avoidance - 80-acre Spacing					
	Production Wells	8		11	11
	Transportation Corridors		<1	1	<1
	Total			12	11
Potential Additional Drilling/Alternative C1 - Security Areas Protection - 160-acre Spacing					
	Production Wells	15		21	21
	Transportation Corridors		5	38	18
	Total			59	39
Potential Additional Drilling/Alternative C2 - Security Areas Protection - 80-acre Spacing					
	Production Wells	29		41	41
	Transportation Corridors		7	61	29
	Total			102	70
Potential Additional Drilling/No Action Alternative					
	Production Wells	0		0	0
	Transportation Corridors		0	0	0
	Total			0	0

[1] No compressor sites, injection wells or evaporation ponds are likely to be within raptor nest avoidance buffer zones.

TABLE 5.2-9
ADDITIONAL DRILLING SCENARIOS: FACILITIES RESTRICTED FROM CONSTRUCTION BY WINTER CLOSURE[1] AVOIDANCE BUFFER ZONES

Alternative	Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Potential Additional Drilling/Proposed Action - 160-acre Spacing					
Production Wells		94		131	131
Transportation Corridors			21	167	80
Total				299	211
Potential Additional Drilling/Alternative A - 80-acre Spacing					
Production Wells		267		374	374
Transportation Corridors			20	169	80
Total				543	454
Potential Additional Drilling/Alternative B1 - Critical Areas Avoidance - 160-acre Spacing					
Production Wells		71		99	99
Transportation Corridors			16	128	61
Total				227	160
Potential Additional Drilling/Alternative B2 - Critical Acres Avoidance - 80-acre Spacing					
Production Wells		187		260	260
Transportation Corridors			33	268	95
Total				528	355
Potential Additional Drilling/Alternative C1 - Security Areas Protection - 160-acre Spacing					
Production Wells		71		99	99
Transportation Corridors			18	143	51
Total				242	150
Potential Additional Drilling/Alternative C2 - Security Areas Protection - 80-acre Spacing					
Production Wells		201		281	281
Transportation Corridors			38	307	117
Total				588	398

[1] No injection wells or evaporation ponds are likely to be within gated area. Winter closure would not be implemented for the No Action Alternative.

TABLE 5.2-10
ADDITIONAL DRILLING SCENARIOS - SAND/GRAVEL AND FRESH WATER REQUIREMENTS FOR THE CONSTRUCTION OF MAJOR FACILITIES

		Potential Additional Drilling/Proposed Action	Potential Additional Drilling/ Alternative A	Potential Additional Drilling/ Alternative B1	Potential Additional Drilling/ Alternative B2	Potential Additional Drilling/ Alternative C1	Potential Additional Drilling/ Alternative C2	Potential Additional Drilling/ No Action
Sand/Gravel	Roads	104,300	195,000	190,000	932,500	405,000	1,021,000	297,500
(yd^3)	Wells	161,500	413,600	68,500	336,200	145,400	368,100	107,200
	Compressor Facilities	26,800	46,900	26,800	40,200	26,800	40,200	20,100
	Injection Wells	8,600	21,500	8,600	17,200	8,600	19,350	4,300
	Evaporation Ponds	640	1,600	640	1,280	640	1,440	320
	TOTAL	301,840	678,600	294,540	1,327,380	586,440	1,450,090	429,420
Water	Roads and Wells	36.1	397.0	65.7	322.7	140.0	353.3	102.9
(ac-ft)	Compressor Facilities	4.8	8.4	4.8	7.2	4.8	10.8	2.4
	Injection Wells	6.1	15.3	6.1	12.2	6.1	13.7	3.0
	Evaporation Ponds	0.6	1.4	0.6	1.1	0.6	1.3	0.3
	TOTAL	47.6	422.1	77.2	343.2	151.5	379.1	108.6

Proposed Action - 160-acre spacing
Alternative A - 80-acre spacing
Alternative B1 - Critical Areas Avoidance - 160-acre spacing
Alternative B2 - Critical Areas Avoidance - 80-acre spacing
Alternative C1 - Security Areas Protection - 160-acre spacing - BLM Preferred Alternative
Alternative C2 - Security Areas Protection - 80-acre spacing

TABLE 5.3.4-1

RELATIONSHIP BETWEEN BIG GAME HERD UNITS AND PROJECTS CONSIDERED FOR CUMULATIVE IMPACT ANALYSIS

Species	Herd Unit	Project
Mule Deer	Northeast Manti	• Price CBM Project west of Highways 10 and 6 • Potential development of Ferron Fairway (part) • Coal mine (Blue Blaze) • Potential Questar Pipeline • Community development (O'Brien, Broken Mesa, Westwood Phase III, South Meadows)
	Range Creek	• Ongoing and proposed CBM projects north of Price (Helper CBM and Pilot Projects, Matts Summit, Castlegate) • Additional drilling in EIS area northeast of Highway 6 • Potential drilling of Ferron Fairway (part) • Coal mines (Horse Canyon, B Canyon, Dugout, and Willow Creek) • Community development (Leavitt's) • Potential logging
	San Rafael	• Additional drilling in EIS area southwest of Highways 6 and 10 • Community development (Circle K, Rosewood Estates)
	Southeast Manti	• Ongoing CBM projects southwest of Price (Grimes Wash and Buzzards Bench) • Potential development of Ferron Fairway (part) • Potential Questar Pipeline • Potential logging
	Salina	• Potential development of Ferron Fairway (part) • Potential Questar Pipeline • Potential logging

TABLE 5.3.4-1

RELATIONSHIP BETWEEN BIG GAME HERD UNITS AND PROJECTS CONSIDERED FOR CUMULATIVE IMPACT ANALYSIS

Species	Herd Unit	Project
Elk	Manti	• Price CBM Project • Additional drilling in EIS area west of Highways 10 and 6, • Ongoing CBM projects southwest of Price (Buzzard Bench and Grimes Wash) • Potential development of Ferron Fairway (part) • Potential Questar Pipeline • Coal mine (Blue Blaze) • Community development (O'Brien, Broken Mesa, Westwood Phase III, South Meadows) • Potential logging
	Range Creek	• Additional drilling in EIS area northeast of Highway 6 • Ongoing and proposed CBM projects north of Price (Helper CBM Project and Pilot Projects, Matt's Summit, and Castlegate) • Additional drilling in EIS area northeast of Highway 6 • Potential drilling of Ferron Fairway (part) • Potential Questar Pipeline • Coal mines (Horse Canyon, B Canyon, Dugout, and Willow Creek) • Community development (Leavitt's) • Potential logging
	Fishlake	• Potential development of Ferron Fairway (part) • Potential Questar Pipeline • Potential logging

TABLE 5.3.6-1

SUMMARY COMPARISON OF CUMULATIVE VISUAL IMPACTS POTENTIAL ADDITIONAL DRILLING ALTERNATIVES

Key Observation Points	Proposed Action - 160-acre Spacing			Alternative A 80-acre Spacing	Alternative B1 Critical Areas Avoidance 160-acre Spacing	Alternative B2 Critical Areas Avoidance 80-acre Spacing	Alternative C1 Security Areas Protection 160-acre Spacing	Alternative C2 Security Areas Protection 80-acre Spacing	No Action Alternative
	Distance Zone[1]	Impact	Facilities/Activities						
RESIDENTIAL									
Communities									
City of Price - Center	FG	Significant	Wells, Dust, Trucks	Greater than Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project	Greater than Proposed Project	Same as Proposed Project
Spring Glen/Carbonville	FG	Significant	Wells, Dust, Trucks	Greater than Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project	Greater than Proposed Project	Same as Proposed Project
Community of Elmo	FG	Significant	Wells, Dust, Trucks	Greater than Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project	Greater than Proposed Project	Same as Proposed Project
Wellington	FG	Significant	Wells, Dust, Trucks	Greater than Proposed Project	Same as Proposed Project	Same as Proposed Project	Same as Proposed Project	Greater than Proposed Project	Same as Proposed Project
Dispersed Residential -									
Gordon Creek Road	FG/MG	Significant	Wells, Roads, Trucks	Greater than Proposed Project	Less than Proposed Project	Less than Proposed Project	Significant - Slightly less than Proposed Project	Similar to Proposed Project	Same as Proposed Project
South and West of Price	FG	Significant	Wells, Roads, Trucks	Greater than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Same as Proposed Project
West of Elmo	FG	Significant	Wells, Roads, Trucks	Greater than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Same as Proposed Project

TABLE 5.3.6-1

SUMMARY COMPARISON OF CUMULATIVE VISUAL IMPACTS
POTENTIAL ADDITIONAL DRILLING ALTERNATIVES

Key Observation Points	Proposed Action - 160-acre Spacing: Distance Zone[1]	Proposed Action - 160-acre Spacing: Impact	Proposed Action - 160-acre Spacing: Facilities/Activities	Alternative A 80-acre Spacing	Alternative B1 Critical Areas Avoidance 160-acre Spacing	Alternative B2 Critical Areas Avoidance 80-acre Spacing	Alternative C1 Security Areas Protection 160-acre Spacing	Alternative C2 Security Areas Protection 80-acre Spacing	No Action Alternative
RECREATION									
Woodhill Open Space	FG	Significant	Dust, Roads, Trucks	Greater than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Same as Proposed Project
			Wells						
County Recreation Trails									
- Pinnacle Creek/Bench	FG	Significant	Compressor St., Roads	Greater than Proposed Project	Less than Proposed Project	Less than Proposed Project	Similar to Proposed Project	Greater than Proposed Project	Less than Proposed Project
	MG	Significant	Wells, Dust, Trucks	Greater than Proposed Project	Less than Proposed Project	Less than Proposed Project	Similar to Proposed Project	Greater than Proposed Project	Less than Proposed Project
- Kenilworth/Price Trail	FG	Significant	Wells, Dust, Trucks	Greater than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Similar to Proposed Project	Greater than Proposed Project	Same as Proposed Project
Consumer Wash Road	FG	Significant	Wells, Roads, Dust,	Greater than Proposed Project	Less than Proposed Project	Less than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Less than Proposed Project
	MG	Moderate	Trucks, Road grading	Greater than Proposed Project	Less than Proposed Project	Less than Proposed Project	Similar to Proposed Project	Greater than Proposed Project	Less than Proposed Project
Gordon Creek Road	FG	Significant	Wells, Dust, Trucks	Greater than Proposed Project	Less than Proposed Project	Similar to Proposed Project	Similar to Proposed Project	Greater than Proposed Project	Less than Proposed Project
	MG	Moderate	Roads	Greater than Proposed Project	Less than Proposed Project	Less than Proposed Project	Similar to Proposed Project	Greater than Proposed Project	Less than Proposed Project
Horse Bench	FG	Significant	Wells, Dust, Trucks	Greater than Proposed Project	Less than Proposed Project	Moderate - Less than Proposed Project	Similar to Proposed Project	Greater than Proposed Project	Less than Proposed Project

TABLE 5.3.6-1

SUMMARY COMPARISON OF CUMULATIVE VISUAL IMPACTS POTENTIAL ADDITIONAL DRILLING ALTERNATIVES

Key Observation Points	Proposed Action - 160-acre Spacing			Alternative A 80-acre Spacing	Alternative B1 Critical Areas Avoidance 160-acre Spacing	Alternative B2 Critical Areas Avoidance 80-acre Spacing	Alternative C1 Security Areas Protection 160-acre Spacing	Alternative C2 Security Areas Protection 80-acre Spacing	No Action Alternative
	Distance Zone[1]	Impact	Facilities/Activities						
	MG	Moderate	Roads	Greater than Proposed Project	Less than Proposed Project	Moderate - Less than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Less than Proposed Project
County Fairgrounds	FG	Moderate	Dust, Trucks	Greater than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Less than Proposed Project
ROADWAYS									
Highway 6	FG	Significant	Dust, Trucks, Wells	Greater than Proposed Project	Same as Proposed Project	Similar to Proposed Project	Same as Proposed Project	Greater than Proposed Project	Same as Proposed Project
Highway 10	FG/MG	Moderate	Dust, Trucks, Wells	Greater than Proposed Project	Same as Proposed Project	Mod - Greater than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Less than Proposed Project
Highway 155	FG/MG	Moderate	Dust, Trucks, Wells	Greater than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Same as Proposed Project	Greater than Proposed Project	Less than Proposed Project
Highway 122	FG/MG	Moderate	Dust, Trucks, Wells	Greater than Proposed Project	Less than Proposed Project	Similar to Proposed Project	Same as Proposed Project	Greater than Proposed Project	Less than Proposed Project

[1]Distance zones are as follows:
FG = Foreground
MG = Middleground

Chapter 6.0

6.1 PUBLIC INVOLVEMENT

As required under NEPA, opportunity must be provided for public involvement during the EIS process to identify pertinent issues and concerns with the Proposed Action. The initial public comment period involves a public scoping meeting and subsequent 30-day comment period.

The purpose of public scoping is to focus the analysis on significant issues and reasonable alternatives in order to eliminate extraneous discussion and to reduce the length of the EIS. Scoping is not a single, isolated action, but an ongoing process. The scoping process helps to: (1) involve the public and affected agencies early in the process, (2) objectively identify public issues and concerns about the Proposed Action, (3) gather additional information about the issues, and (4) identify a reasonable range of alternatives and potential impacts to be addressed.

The public scoping process for this EIS began August 15, 1994, with the publication of a Notice of Intent in the Federal Register. A news release was sent to all local papers and news media on August 18, 1994. A public scoping meeting was held by the BLM on September 8, 1994 at the Court House in Price, Utah. A total of 57 individuals signed the attendance sheet for the meeting. The public was encouraged to submit comments at the meeting or in writing to the BLM, Moab District. Verbal comments provided to the meeting were recorded and summarized on flip charts. Seventeen written comment letters were received by the BLM.

An internal agency scoping meeting attended by personnel from the BLM, U.S. Forest Service, Utah Division of Wildlife Resources and Carbon County was held on September 15, 1994. Written comments were also received from the BLM Resource Specialists from the Price River /San Rafael Resource Area. More detailed information regarding the public scoping process for this project, including copies of attendance sheets, a record of verbal comments, and copies of written comment letters and responses, is provided in the Public Scoping Summary Report (WCC 1995).

6.2 CONSULTATION

The following list consists of government agencies, businesses, organizations, and individuals that were contacted or consulted during the scoping process and preparation of this Draft EIS.

The BLM is consulting with the State Historic Preservation Officer (SHPO), the President's Advisory Council on Historic Preservation (ACHP) and River Gas to prepare a Programmatic Agreement for cultural resource inventories. This document is in negotiation and will be included in the Final EIS for public review. The Programmatic Agreement will be completed as a legally binding document prior to issuance of a Record of Decision for the project.

<u>Federal Offices</u>

Advisory Council on Historic Preservation

Federal Energy Regulatory Commission

U.S. Fish & Wildlife Service, Utah Field Office
Bob Williams - Asst. Field Supervisor
Reed Harris - Field Supervisor
Ted Owens
Marilet Zoblam

U.S. Forest Service
David Hatfield - Manti La Sal National Forest

__State Offices__

Natural Resource Conservation Service
Leland Sasser - Soil Scientist
George Cook - Range Conservationist

State Historic Preservation Officer

Utah State University - Cooperative Extension Service
Dennis Worwood - Emery Co. Extension Agent
Jack Soper - Carbon Co. Extension Agent

Utah Department of Community and Economic Development
Shirl Clarke - Administrator, Permanent Community Impact Fund

Utah Department of Employment Security
Larrus Hunting - Director, Price Office
Tom Jewell - Staff Person, Price Office

Utah Department of Natural Resources, Office of Energy and Resource Planning
Thomas Brill - Economist

Utah Division of Air Quality
Tim Blanchard
Mike Behesthi
Tom Unth

Utah Division of Oil, Gas, and Mining
Darren Haddock
Frank Matthews - Petroleum Geologist

Utah Division of State History
Evie Seeliner - Antiquities Section

Utah Division of Water Rights
Mark Page - Regional Engineer

Utah Division of Wildlife Resources
Bill Bates - Habitat Manager
Ben Morris - Habitat Biologist
Kevin Christopherson - Regional Fisheries Manager, Price
Karl Gramlich - Law Enforcement
Joel Peterson - Information Manager Utah Natural Heritage Program
Ted Owens

Utah Geological Survey
David Tabet

Utah Governor's Office of Planning and Budget
Peter Donner - Economist

Utah Office of Energy and Resource Planning
Jim Gallanus

Utah Power and Light
Ray Kirk - Environmental Engineer

__Local Offices__

Carbon County
David Levanger - County Building Inspector, County Planning Commission Staff
James Jensen - Carbon County School District - Superintendent (retired)
Randy Russell - Director, Carbon County Future
Val Bush - Carbon County School District - Superintendent
Bob Pero - County Clerk/Auditor
Dennis Dooley - Civil Defense and Special Projects
Jim Robertson - Carbon County Sheriffs Office - Sheriff
L. Semken - Carbon County Roads Special Service District
Matt Wise - Carbon County Weed Control
Cindy Lou McDonald - Carbon County Planning and Building Department

Michelle Lea - Director Carbon County Future
Randy Russell - Former Director, Carbon County Future
Fred Halverson - Assessor
Howard Jennings - Engineer, County Road Department

Emery County
Ross Huntington - Emery County Auditor
J. Nielson - Emery County Weed Control
Jan Crawford - Emery County School District - Director Pupil Services

Price River Water Improvement District
Jeff Richins - Wastewater Treatment Plant Operator
Ken Snook - Potable Water Treatment Plant Operator
Phil Palmer

Southwest Utah Association of Local Governments
Deborah Hatt - Business Manager, C.D. B.G. Program Manager

<u>**Industry/Consultants**</u>

River Gas Corporation
Randy Allen - General Counsel
Michael Farrens - Executive Vice President, Development
Charles Willis - Project Engineer
Joey Stephenson - Landman
Terry Burns - Geologist
Steven Prince - Operations Manager
Billy Stacy - Vice President, Utah Operations

IntraSearch Inc.
Lundy C. Gammon - Manager, Photo Lab
Ray Platt

Bear West Consultants
Rulon Dutson
Ralph Becker

Avocet Consulting, Inc.
Jimmie Parrish - Principal

Intermountain Ecosystems, Inc.
Ron Kass

Caterpillar/Solar Turbines
Bob Johnson

NELCO Contractors, Inc.
Neil Branson
Larry Jensen

Anadarko Petroleum Corporation
Craig Walters

Franson, Noble and Associates
Richard Noble

6.3 DISTRIBUTION LIST

The following is a list of agencies, organizations and individuals to whom this Draft EIS has been distributed.

<u>**Federal**</u>

Bureau of Land Management
- BLM Director, Washington, D.C.
- External Affairs, Washington, D.C.
- Utah State Office
- Moab District Office
- Price River/San Rafael Resource Area Office

Bureau of Mines
National Park Service
U.S. Army Corps of Engineers
- San Francisco, CA

USDOI - Office of Environmental Policy and Compliance
U.S. Environmental Protection Agency
- Region VIII, Denver, CO
- NEPA Compliance Division, Washington, D.C.

U.S. Fish and Wildlife Service
Washington, D.C.
Salt Lake City, Utah
U.S. Forest Service, Price Utah
U.S. Geological Survey

State of Utah

Division of Oil, Gas and Mining
Division of Water Rights
Division of Water Quality
Division of Wildlife Resources
Office of Planning and Budget
Southeast Utah District Health Department
Utah Geological Survey
Utah Job Service
Utah State University - Extension Service

County

Carbon County Commissioners
Carbon County Recreation
Emery County Commissioners
Emery County Planning and Zoning
Emery County Recorder
Price River Water Improvement District

Libraries

Grand County Public Library
Price City Library
Castle Dale Library
Natural Resources Library
Washington, DC

Organizations

Law Fund
Moab Sportsmen's Club
Utah Wilderness Association

Businesses

Anadarko Petroleum Corporation
Ballard Spahr Andrews & Ingersoll
Bjork, Seavy, Lindley & Danielson, P.C.
Pacificorp Interwest Mining
River Gas Corporation

Individuals

Price, Utah
Ernest and Nancy Bentley
Daniel Bittick (ORV Advisory Board)
Dr. Claron D. Bjork
Ray Buckland
Don Burge
Curtis Card
Kevin Christopherson (The Wild Bunch)
Ty and Marge Curtis
Wes Curtis
John Dovers
Neil and Bonnie Frandsen
Terry Gibbs
Bruce and Brenda Hansen
Fred Harrell
Jeannie Houskeeper
Mac Huntington
Jerry Jensen
Larry Jensen
Lee Johnson
Drew Krajnyak
Jim and Karen Krpan
Helen Leavitt
Bobbie Mabbutt
Phyllis Marsing
R. Martin
Floyd McKee
Layne Miller
Michael Milovich
Mark Page
Elias and Lori Perez
Don and Joyce Polster
Carter Reed
Jean Semborski
Paul Sheya
Cathy and Rick Shiner
Jeff Smith
Stanley and Pamela Swanson
Ron Vogel
Gary Xanthias

Moab, Utah
Vicky Barker
Jayne Belnap
Bill Love
Dee Tranter

Helper, Utah
Jeff Duncen
Michael S. Milovich

Wellington, Utah
Ben and Renee Brown
Kenneth W. Phippen

Castle Dale, Utah
Alan Thorpe
Craig Johansen

Orangeville, Utah
Wes Curtis
Mac Huntington

Salina, Utah
Chris Kravits

Salt Lake City, Utah
Alan Bowes
Phyllis Marsing
George Nickas
Lyle Peterson

Outside Utah
Robert Anderson
Bob Brock
George Brown
Scott A. Bodin
Ed Evatz
David Gilmore
Jerry Jones
Laura Lindley
Steven Rauzi
Bill Savage

6.4 LIST OF PREPARERS

The Price CBM EIS was prepared by a third party contractor working under the direction of and in cooperation with the lead agency for the project, which is the BLM Price River/San Rafael Resource Area, and Moab District Office.

The following tables identify the core BLM (Table 6-1) and consultant (Table 6-2) interdisciplinary teams that were principally involved with preparing this Draft EIS.

Plates

Chapter 6.0
Tables

TABLE 6-1

PRICE COALBED METHANE PROJECT
LIST OF BLM INTERDISCIPLINARY TEAM EIS PREPARERS

Name	Responsibility
BUREAU OF LAND MANAGEMENT	
Utah State Office	
Boyd Christensen	Water Resources
George Diwachak	Mineral Resources
Allen McKee	Mineral Resources
Garth Portillo	Cultural Resources
Greg Thayn	Environmental Coordinator
Jeff Williams	Socioeconomics
Moab District	
Ann Marie Aubry	Geology/Mineral Resources
Bob Dalla	Mineral Resources
Jim Harte -	Water Resources
Eric Jones	Geology/Mineral Resources
Kate Kitchell	Moab District Manager
Bill Stringer	Associate District Manager
Daryl Trotter	Planning and Environmental Coordinator
Price River/San Rafael Resource Area	
Mark Bailey	Area Co-Manager
Penny Dunn	Area Co-Manager
Kerry Flood	Water Resources
Karl Ivory	Range Conservation
Ray Jenson	Range Conservation
Mark Mackiewicz	Soils
Blaine Miller	Cultural Resources
David Mills	Wildlife Resources
Dean Nyffeler	Geology
Tom Rasmussen	Paleontology
Don Stephens	Oil and Gas
Dennis Willis	Recreation, Visual Resources

TABLE 6-2

PRICE COALBED METHANE PROJECT
LIST OF CONSULTANT INTERDISCIPLINARY TEAM EIS PREPARERS

Name	Affiliation	Education	Responsibility
Karen Baud	Woodward-Clyde	M.A., Biology	Biological Resources, Document Coordinator
Ron Beane	MDG, Inc.	M.A., Biology	Wildlife, Special Status Species
Richard Bell	Woodward-Clyde	B.S., Biology, Geology, Chemistry	Project Management, Soils, Health and Safety
Susan Chandler	Alpine Archaeological	M.A., Anthropology, Archaeology	Cultural Resources
Paula Daukas	Woodward-Clyde	M.S., Water Resources Management	Project Management, Water Resources
Jeffrey Dawson	Woodward-Clyde	M.S., Botany	Vegetation, Wetlands, Wildlife, Special Status Species
Ian Fraser	Woodward-Clyde	M.S., Geology	Geology, Water Resources
Chris Freeman	Woodward-Clyde	B.S., Environmental Policy Analysis and Planning	Socioeconomics/Quality of Life, Transportation
Perry Fontana	Woodward-Clyde	M.S., Meteorology	Air Quality, Noise
David Jones	Woodward-Clyde	B.S., General Agriculture, Landscape Horticulture	Livestock Management, Recreation
Christine Keller	View Point West	M.A., Geography	Land Use, Visual Resources
Chris Paulsen	Woodward-Clyde	B.S., Forestry Management	Soils
Chris Williams	Woodward-Clyde	M.S., Earth Resources	Soils

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GLOSSARY

ACCLIMATE - To undergo physiological change leading to adaptation to a change in an environmental factor.

ACREAGE - Area of land in acres; an acre is equal to 160 square rods, 4,840 square yards, or 43,560 square feet.

ALKALINE - The opposite of acid, also called basic; having a high pH value and thus a low concentration of hydrogen ions and a high concentration of hydroxide ions.

ALKALINITY - The degree to which a substance is alkaline or basic; the extent to which its pH value lies above the neutral value of 7.2.

ALLOTMENT - An area of land where one or more permittees graze their livestock. Generally consists of public land but may include parcels of private or State lands. The number of livestock and season of use are stipulated for each allotment. An allotment may consist of several pastures or be only one pasture.

ALLUVIAL - Of or relating to river and to stream deposits.

ALLUVIUM - Material, such as rocks, sand silt, or clay, deposited on land by streams.

ALTERNATIVE - A combination of management prescriptions applied in specific amounts and locations to achieve a desired management emphasis or expressed in goals and objectives. One of several policies, plans, or projects proposed for decision making.

AMBIENT - Surrounding, or present in background, as in ambient noise levels, air temperature, or water temperature.

ANIMAL UNIT MONTH (AUM) - The amount of forage necessary for the sustenance of a 1,000 pound dry cow in maintenance or gestation, or five sheep for 1 month.

ANTICLINE - The arch or crest of a fold in rock strata.

AQUIFER - A water-bearing bed or layer of permeable rock, sand, or gravel capable of yielding water; or the part of a water-drive reservoir that contains the aquifer.

ARCHAEOLOGICAL EVIDENCE - All prehistoric and historic physical evidence of past human activity which can be used to reconstruct lifeways and cultural history of past peoples. These resources include sites, artifacts, environmental data, and all other relevant information and the contexts in which they occur.

ARTHROPOD - An animal with a segmented body and jointed limbs.

ARTIFACT - Any object made, modified, or used by humans, usually moveable. Objects which are recorded as prehistoric or historic artifacts have sociocultural or scientific values and meet the general criterion of being more than 50 years old.

BADLAND - Steep or very steep, commonly non-stony barren land dissected by many intermittent drainage channels. Badland is most common in semi-arid and arid regions where steams are entrenched in soft geologic material. Runoff potential is very high, and geologic erosion is active in such areas.

BERM - A nearly horizontal deposit of beach material accumulated by wave action near the water's edge.

BICARBONATE - A salt or compound containing two equivalents of carbonic acid to one of a base.

BITUMINOUS COAL - The shiny black coal familiarly known as house-hold coal, which according to classification of coals is of higher rank, i.e. has a higher fixed carbon content.

BRACHIOPOD - A marine invertebrate with bivalve dorsal and ventral shells and a pair of tentacled, armlike structures on either side of the mouth.

BROWSE - Tender parts of woody vegetation that are eaten as food by animals; to consume browse. Browsing is distinct from grazing because it refers to eating woody material, whereas grazing is usually restricted to nonwoody plants.

BROWSERS - Animals such as deer that consume woody vegetation.

BRYOZOAN - Any of the small aquatic animals of the phylum Bryozoa that reproduce by budding and form mosslike or branching colonies.

BURROW - A hole dug in the ground by certain small animals to serve as an abode.

CALCAREOUS SOIL - Soil that contains a high concentration of calcium carbonate.

CALCIUM CARBONATE - A naturally occurring form of calcium that is called calcite. Chalk and limestone are both calcium carbonate.

CAMBRIAN - The first geologic time period of the Paleozoic era. The Cambrian period spanned from approximately 590 to 505 million years ago; the system of strata deposited during that time period.

CANOPY - The top layer of a forest or wooded ecosystem consisting of overlapping leaves and branches of trees, shrubs, or both.

CARBONACEOUS - Coaly; pertaining to, or composed largely of carbon.

CHLORIDE - The ionic form of the element chlorine, where the chlorine atom has gained one electron (Cl^-). Many metals readily form chlorides.

CHRISTMAS TREE - A collection of valves, located at the top of casing, from which tubing in the well is suspended.

CLIMATOLOGY - Science of climate and its causes.

COAL BED - A seam or stratum of coal parallel to the rock stratification.

COAL SEAM - A bed of coal in the natural position parallel to other rock strata.

COELENTERATE - Phylum of aquatic, radially symmetrical animals in which the general form of the body is sac-like, with a single opening at the oral end which is surrounded by tentacles and opens into a digestive cavity.

COLLUVIUM - Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

COMPRESSOR FACILITY - A permanent facility which increases the pressure on gas to move it in transmission lines or into storage.

CONGLOMERATE - A rock composed of rounded pebbles cemented together in ;a matrix of finer material (often sandy); it is thus consolidated gravel or shingle.

CONIFEROUS - Bearing cones; describing or belonging to the large group of trees and shrubs that bear cones and are typically evergreens, with needles for leaves.

CRETACEOUS - The third and latest of the periods included in the Mesozoic Era; also the system of strata deposited in the Cretaceous Period.

CRITICAL HABITAT - Sensitive use areas that are of limited abundance and/or possess unique qualities, thereby constituting irreplaceable, critically necessary habitat.

CULTURAL RESOURCE - Remains of human activity, occupation, or endeavor, as reflected in sites, buildings, artifacts, ruins, etc.

CULVERT - A pipe or other artificially enclosed channel that carries a watercourse below ground level.

CUMULATIVE IMPACTS - The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

DE FACTO - Actually exercising power.

DECIDUOUS - Describing plants that shed their leaves at the end of each growing season.

DEGRADATION - A process which tends to wear down the land surface; it is usually applied to a river, and involves the deepening of its valley by the river.

DELTAIC ZONES - A triangular alluvial deposit at the mouth of a river.

DEPOSITION - The laying down of solid material which has been carried from a distant part of the earth's crust by some natural agency such as rivers, wind, glaciers, and the sea. Deposition is one of the two major processes of earth sculpture, the other being denudation.

DESORB - The opposite of adsorb; the release of materials from being adsorbed onto a surface.

DIRECTIONAL DRILLING - The intentional deviation of a wellbore from vertical to reach subsurface areas off to one side from the drilling site.

DISCHARGE - The flow rate of a fluid at a given instant expressed as volume per unit of time.

DISPLACEMENT - As applied to wildlife, forced shifts in the patterns of wildlife use, either in location or timing of use.

DISTURBANCE - An event that changes the local environment by removing organisms or opening up an area, facilitating colonization by new, often different, organisms.

DIURNAL - Occurring daily; active during daylight.

DIVERSITY - The number of different species, and their relative abundance, in an area. Diversity is a measure of the complexity

of an ecosystem, and often an indication of its relative age.

DRAWDOWN - The regulation of groundwater withdrawal to control the lowering of a water table.

DRILL PAD - A relatively flat work area that contains equipment and facilities used for well drilling and well completion.

DRILLING - The operation of boring a hole in the earth, usually for the purpose of finding and removing subsurface formation fluids such as oil and gas.

DRILLING FLUIDS - The circulating fluid used to bring cuttings out of the wellbore, cool the drill bit, provide hole stability, and pressure control.

DRILLING RIG - The derrick, draw-works and attendant surface equipment of a drilling or workover unit.

ECHINODERM - An exclusively marine phylum of dueterostome animals with a secondarily derived, five-spoked radial symmetry in adults without a head or brain.

ECOSYSTEM - A functioning unit of nature that combines biotic communities and the abiotic environments with which they interact. Ecosystems vary greatly in size and characteristics.

EDDY - A minor reverse flow caused by an obstacle in the primary direction of flow of fluid such as water or smoke.

EMERGENT PLANT - Herbaceous wetland plant whose roots grow in shallow water but whose photosynthesizing structures (stems and leaves) extend above the water surface during the growing season

EMISSION - Waste discharged into the environment by human processes.

ENCROACHMENT - Advancement beyond prescribed limits.

ENVIRONMENTAL IMPACT STATEMENT - A detailed written statement as required by Sec.102(2)(C) of the National Environmental Policy Act.

EPHEMERAL DRAINAGE - Of short duration, as an ephemeral drainage that disappears in summer.

EROSION - The physical removal of rock or soil particles by a transport agent such as running water, wind, glacial ice, and gravity.

ESCARPMENT - An inland cliff or steep slope, formed by the erosion of inclined strata of hard rocks, or possibly as a direct result of a fault.

EVAPORATION POND - An industrial containment area designed to allow briny water to evaporate by using solar energy.

EXCAVATE - To form by hollowing out.

EXTIRPATE - Eradication; the loss or removal of a species from one or more specific areas, but not from all areas.

FAULT - A fracture in the earth's crust along which movement has taken place, and where the rock strata on the two sides therefore do not match.

FAUNAL - Animals as a whole, especially those of a specific region or period.

FEDERAL LANDS - All lands and interests in lands owned by the U.S. that are subject to the mineral leasing laws, including mineral resources or mineral estates reserved to the U.S. in the conveyance of a surface or non-mineral estate.

FLEDGLING DEPENDENCY PERIOD - The period beginning when the young leave the nest to when they are no longer dependent upon adults for food.

FLOODPLAIN - The relatively flat land adjacent to a river channel that is constructed of unconsolidated sediment deposited by periodic flooding and lateral migration of the river channel.

FLUVIAL - Comprehensive term for river processes.

FORAGE - Food for animals, especially that obtained by grazing or browsing; to look for food.

FORB - Any herbaceous (non-woody) plant having broad leaves, and therefore excluding grasses and grasslike plants. Forb is used especially to distinguish non-grass species when discussing grasslands and prairies.

FRAC (FRACING) - A method of stimulating well production by increasing the permeability of the producing formation. Under extremely high hydraulic pressure, the fracturing fluid is pumped into the formation which parts or fractures it. Proppants or propping agents such as sand or glass beads are pumped into the formation as part of the fracturing job. The proppants become wedged in the open fractures, leaving channels for oil to flow into the well after the hydraulic fracture pressure is released.

FRIABILITY - A term describing the physical consistency of a soil or the degree to which a soil crumbles when handled.

GRABEN - A valley which has been formed by the sinking of land between two roughly parallel faults; such a valley is long in proportion to its width. Grabens are frequently known as rift valleys or trough faults.

HABITUATE - A behavioral change in which animals can become accustomed to unnatural components in their environments.

HERBACEOUS - Resembling an herb, a green, leafy plant that does not produce persistent woody tissue. Herbaceous plants form the lowest layer of vegetation in most plant communities.

HETEROGENEOUS - Make up of a number of elements different from each other, a mixture of dissimilar ingredients.

HIGH PRIORITY HABITAT - Intensive use areas that are highly important but relatively widely distributed.

HORST - An elevated block of rock between parallel faults which has reached its position either through uplift between faults, or through the sinking of the beds outside the faults.

HYDRAULIC CONDUCTIVITY - The rate of water flow in gallons per day through a cross-section of one square foot under a unit hydraulic gradient, at the prevailing temperature or at 60°F (16°C).

HYDRAULIC FRACTURING - A method of stimulating production by increasing the permeability of the producing formation.

IMPACT - The results of an action on the environment; the impact may be primary (direct), secondary (indirect), or cumulative.

INJECTION WELL - A well used to inject fluids into an underground formation to increase reservoir pressure.

INTERDISCIPLINARY TEAM (IDT) - A group selected to work within the NEPA process in scoping, analysis, and document preparation. The purpose of the team is to integrate its collective knowledge of the physical, biological, economic, and social sciences and the environmental design arts into the environmental analysis process. Interaction among team members often provides insight that otherwise would not be apparent.

INVERSION - An increase of temperature with height above the earth's surface, being the reverse of the normal situation, in which the temperature falls with height.

KEYSTONE SPECIES - Organisms that play dominant roles in an ecosystem and affect many other organisms. The removal of a keystone predator from an ecosystem causes a reduction of the species diversity among its former prey.

LATITUDE - The angular distance of a point on the earth's surface north or south of the equator, as measured from the center of the earth.

LENTICULAR - Shaped approximately like a double convex lens.

LIMITED VALUE HABITAT - Occasional use areas that are either sparsely populated or that show sporadic or unpredictable use.

LITHIC - Of or relating to stone or lithium.

LITHOLOGY - A description of the visible texture and composition of rock.

LOAM - A rich, permeable soil composed of a mixture of clay, silt, sand, and organic matter.

MESA - A flat, table-like mass, which falls away steeply on all sides. The harder top layers of rock have resisted denudation, and, being practically horizontal, have maintained a uniform surface parallel to the stratification.

METEOROLOGY - The study of the atmosphere, weather, and climate.

METHANE - The simplest hydrocarbon; natural gas is nearly pure methane.

MITIGATE - To lessen the severity.

MITIGATION - Avoiding the impact altogether by not taking a certain action or parts of an action; minimizing impacts by limiting the degree of magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and/or compensating for the impact by replacing or providing substitute resources or environments.

MOLLUSK - Members of the phylum Mollusca, largely marine invertebrates, including the edible shellfish and some 100,000 other species.

MUDSTONE - A nonfoliated, clay-rich sedimentary rock formed of lithified mud.

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) - The federal law established in 1969, which went into effect on January 1, 1970, that 1) established a national policy for the environment, 2) requires federal agencies to become aware of the environmental ramifications of their proposed actions, 3) requires full disclosure to the public of proposed federal actions and mechanisms for public input into the federal decision-making process, and 4) requires federal agencies to prepare an environmental impact statement for every major action that would significantly affect the quality of the human environment.

NOXIOUS WEED - Officially designated undesirable or invading weedy species generally introduced into an area due to human activity.

OSMOSIS - The process in which a solvent diffuses through a semipermeable membrane, moving toward a solution having greater concentration. Osmosis progresses in the direction of equalizing the concentration on both sides of the membrane.

OUTCROP - Any part of the bedrock that is exposed at the earth's surface.

PALEONTOLOGY - The fossilized flora and fauna as represented in the rock record.

PALEOZOIC - The first of three eras of the Phanerozoic eon in geologic time; the Paleozoic lasted from approximately 590 to 248 million years ago. The term Paleozoic means early life.

PALYNOLOGY - The study of fossil plant spores and the pollen of bogs and lakes. Pollen and spores found in sediments are often the only fossils sufficiently intact to use for correlating fossil layers with geological time.

PALUSTRINE - Inland wetlands such as marshes, wet meadows, and shallow ponds. In the National Wetland Inventory, palustrine includes wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens: and wetlands lacking such vegetation which are less than 20 acres in size, do not have an active wave-formed shore, and are less than 6 feet deep at low water.

PARTICULATES - Small particles in the air that are generally considered pollutants.

PEDIMENT - An erosional surface of low relief, often covered with a veneer of gravel, forming at the foot of a mountain range.

PERENNIAL - A plant whose life cycle lasts longer than two years. The tops of herbaceous perennials die down at the end of the growing season, buds, roots, and underground portions persist.

PERMEABILITY - The extent that a substance is open to passage or penetration, especially by fluids.

pH - The negative logarithm of the concentration of the hydrogen ion in gram atoms per liter, used in expressing both acidity and alkalinity. pH values range from 0 to 14, with 7 indicating neutrality, numbers less than 7 increasing acidity, and numbers greater than 7 increasing alkalinity.

PHYSIOGRAPHIC - Relating to geographical features and land forms.

PREHISTORIC SITE - Archaeologic sites associated with American Indians and usually occurring before contact with Europeans.

PRIMARY RANGE - Areas where the majority of livestock grazing is concentrated, due to high forage production, easy accessibility, nearby water sources, or other reasons.

PROPAGATION - Reproduction of a plant or an animal, especially intentional multiplication or increase of stocks carried out by humans.

PROPOSED ACTION - In terms of NEPA, the project, activity or action that a Proponent intends to implement or undertake and which is the subject of an environmental analysis.

PROTOZOAN - Originally referred to a phylum of single-celled, eukaryotic animals, now placed in the kingdom of Protista.

QUARRY - An open bedrock area where ore or building stone is extracted.

QUARTZOSE SANDSTONE - Any sandstone composed of at least 95 percent clear quartz grains and less than 5 percent feldspar grains and cement matrix.

QUATERNARY - The younger of the two geologic periods or systems in the Cenozoic Era.

RADIOCARBON - Any radioactive isotope of the element carbon. Radiocarbons undergo radioactive decay, which is measured and applied as an absolute dating technique.

RADIOTELEMETRY - The presentation of data at a location remote from the source of the data, using radio-frequency electromagnetic radiation as the means of transmission.

RAPTOR - A bird of prey; a group of carnivorous birds consisting of eagles, hawks, falcons, kites, vultures, and owls.

RARE OR SENSITIVE SPECIES - Species which have no specific legal protection under the Endangered Species Act as threatened or endangered species, but which are of special concern to agencies and the professional biologic community due to low populations, limited distributions, on going population decline, and/or human or natural threats to their continued existence.

RECIPROCATION - A technique performed while cementing, whereby casing is moved up and down the wellbore in order to move the cement slurry uniformly around the wellbore to eliminate channeling and provide an effective cement bond on the casing and formation wells.

RECLAMATION - Rehabilitation of a disturbed area to make it acceptable for designated uses. This normally involves regrading, replacement of topsoil, revegetation and other work necessary to restore it for use.

RENEWABLE ENERGY- Sources of energy that are not depleted by consumption, such as solar and wind energy.

RESERVE PIT - A mud pit in which a reserve supply of drilling fluid is stored.

RESERVOIR - A natural underground rock formation that retains water, oil, or natural gas.

RESIDUUM - (residual soil material) Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

REVEGETATION - The re-establishment and development of self-sustaining plant cover. On disturbed sites, human assistance will speed natural processes by seed bed preparation, reseeding, and mulching.

RICHTER SCALE - A measure of the energy of seismic waves generated by an earthquake.

RIGHT-OF WAY - The legal right for use, occupancy, or access across land or water areas for a specified purpose.

RIMROCK - A top layer of resistant rock on a plateau outcropping with vertical or near vertical walls.

SALINE - Containing common salt or any of the salts of alkali metals or magnesium.

SALINITY - Degree of saltiness; soils with high salinity cannot support plant growth.

SATURATED - The point at which one substance has incorporated as much as possible of another substance; the point of maximum possible concentration.

SCOPING - A term used to identify the process for determining the scope of issues related to a proposed action and for identifying significant issues to be addressed.

SEDIMENT - Soil or mineral transported by moving water, wind, gravity, or glaciers, and deposited in streams or other bodies of water, or on land.

SEDIMENTATION - The deposition of sedimentary particles, which includes gravity settling, chemical precipitation, and biogenic accumulation.

SEISMIC ACTIVITY - Pertaining to an earthquake or earth vibration, including those that are artificially induced.

SEMI-ARID - Describing climates that are not as dry as desert, having light rainfall (usually 10 to 20 inches) capable of sustaining some grasses and shrubs but not enough for woodland.

SHALE - Any fine-grained clastic sedimentary rock composed of clay and silt-sized particles.

SILAGE - Cut grass, cornstalks, or other plants that are harvested while green and stored in silos or concrete bunkers to undergo fermentation; provides important winter feed for cattle.

SILTSTONE - A sedimentary rock composed of a least two-thirds silt-sized particles; a mudstone containing more silt than clay.

SLOPE - The degree of deviation of a surface from the horizontal.

SOLVENT - Any substance used to dissolve another substance (the solute) to form a solution.

STRATA - An identifiable layer of bedrock or sediment; does not imply a particular thickness of rock.

SUBALPINE - Describing the region, the climate, the vegetation, or all three found just below alpine regions, usually on mountainsides at 1300 to 1800 meters in elevation. Subalpine vegetation is that just

below treeline, often dominated by pine or spruce trees.

SUBSTANTIAL VALUE HABITAT - Areas used regularly but at moderate levels, and receiving little or not concentrated use.

SUMMER RANGE - That part of the home range of a species that is not considered winter range, including what has traditionally been known as spring and fall transitional ranges.

SURFACTANT - Any compound that reduces the surface tension of liquids, increasing its wetting ability and spreadibility.

SYNCLINE - A sag in the rock strata in which the layers bend upward away from the fold axis. The oldest layers in an eroded syncline are exposed farthest from the fold axis.

TELEMETRY - Transmitting the readings of instruments to a remote location by means of wires, radio waves, or other means.

TEMPORAL PERIOD - Changes that occur over a period of time, such as on a daily, hourly, or seasonal basis.

THERMAL COVER - Vegetation used by big game to help maintain comfortable body temperatures with minimal energy expenditure.

THREATENED OR ENDANGERED SPECIES - Animal or plant species that are listed under the Federal Endangered Species Act of 1973, as amended, or under the Colorado or New Mexico Endangered Species Act.

THRUST FAULTS - A type of low-angle reverse fault in which the hanging wall overrides the footwall along a dip-slip face that is angled at less than 45 degrees. Thrust faults are typical in regions of tectonic convergence.

TOPOGRAPHY - The features of the earth, including relief, vegetation, and waters.

TOTAL DISSOLVED SOLIDS - A term that describes the quantity of dissolved material in a sample of material.

TRIBUTARIES - Streams that feed or flow into or join a larger stream or a lake.

UNDERSTORY - The lowest layer of trees in a forest; the layer between the overstory tree layer and the shrub layer.

VEGETATION - All of the plants growing in and characterizing a specific area or region; the combination of different plant communities found there.

VISUAL ENVIRONMENT - The composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for visitors.

VISUAL SENSITIVITY LEVELS - An index of the relative degree of user interest in scenic quality and concern and attitude for existing or proposed changes in the landscape features of an area in relation to other areas in the planning unit.

WATERSHED - The total area of land surface from which an aquifer or river system collects its water.

WELL COMPLETION - The final sealing off of a drilled well (after drilling apparatus is removed from the borehole) with valving, safety, and flow-control devices.

WELLBORE - The hole made by the drilling bit.

WELLHEAD - The equipment used to maintain surface control of a well. It is formed of the casing head, tubing head, and Christmas tree. Also refers to various parameters as they exist at the wellhead, such as wellhead pressure, wellhead price of oil, etc.

WELLPAD - Relatively flat work area that contains equipment and facilities used for oil/gas production.

WETLANDS - Those areas that are inundated or saturated with surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

WINTER RANGE - The place where migratory (and sometimes nonmigratory) animals congregate during the winter season.

INDEX

A

B

C

D

E

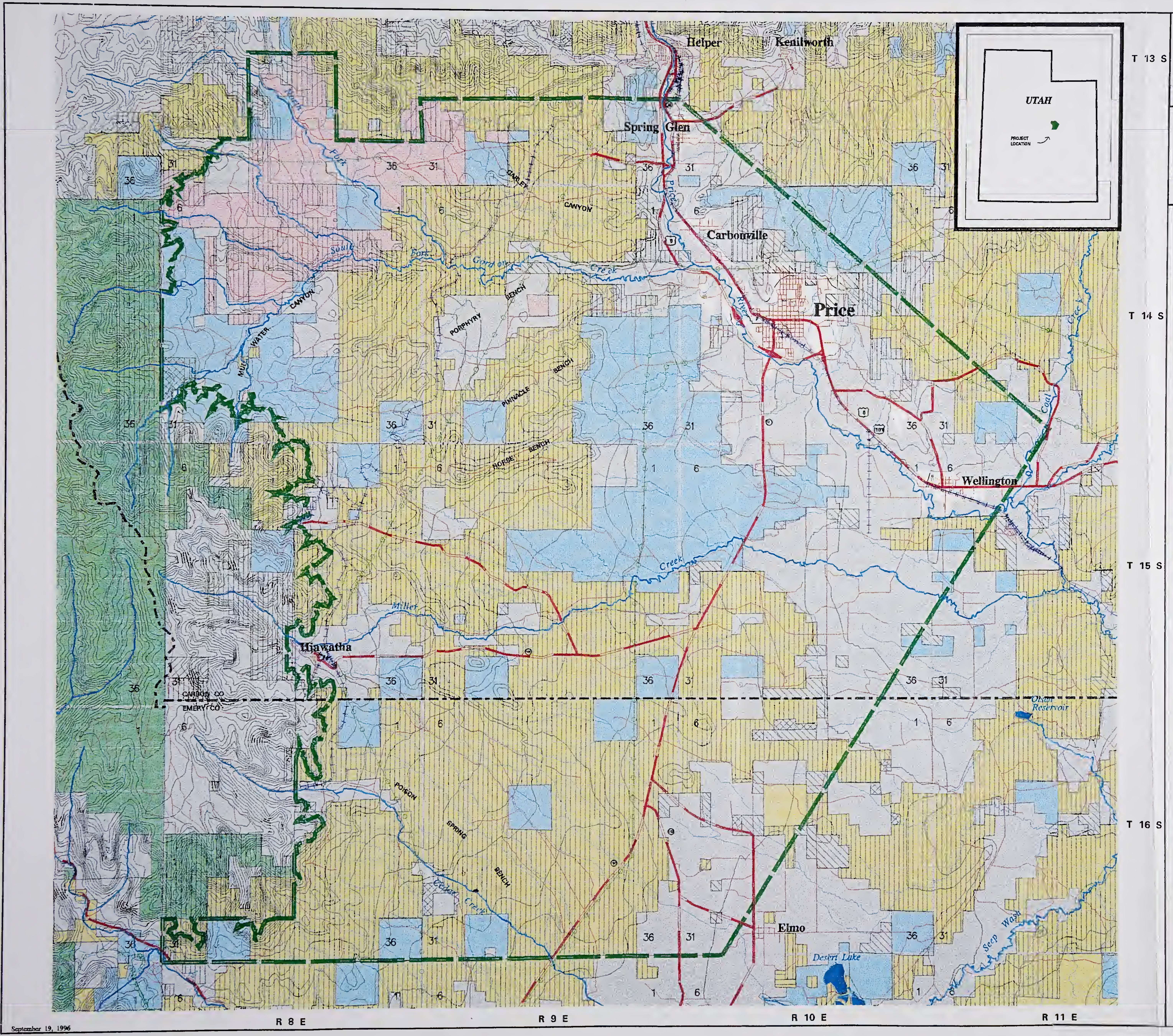
F

G

H

PRICE COALBED METHANE EIS

PLATE 1
SURFACE AND MINERAL ESTATE OWNERSHIP



LEGEND

Contour Interval 40 Meters

- Proposed Price CBM EIS Boundary (RGC Project)
- Primary/Secondary Roads
- Other Roads; Trails
- Railroads
- Existing Pipelines/Transmission Lines
- Hydrology

Surface Land Ownership & Management

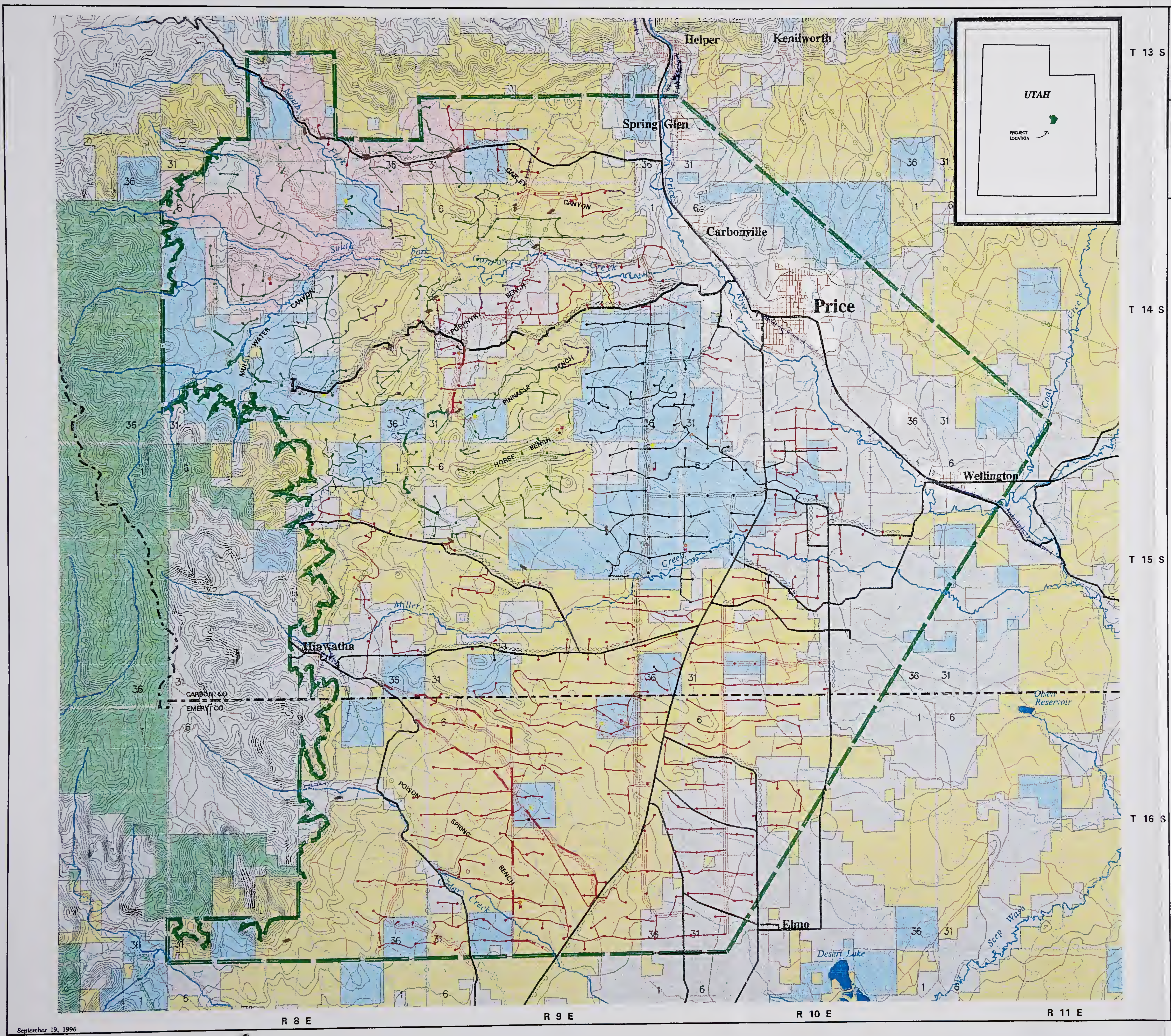
- BLM
- State
- UDWR
- Forest Service
- Private
- Urban Areas (Not included in Project Area)

BLM Mineral Rights

- All Minerals
- Oil & Gas Only
- Oil, Gas & Coal Only

0 1 2 3 4
Miles

Note: Base map information is from the State of Utah, USGS and the BLM.



PRICE COALBED METHANE EIS

PLATE 2
PROPOSED ACTION
160 - ACRE WELL SPACING

LEGEND

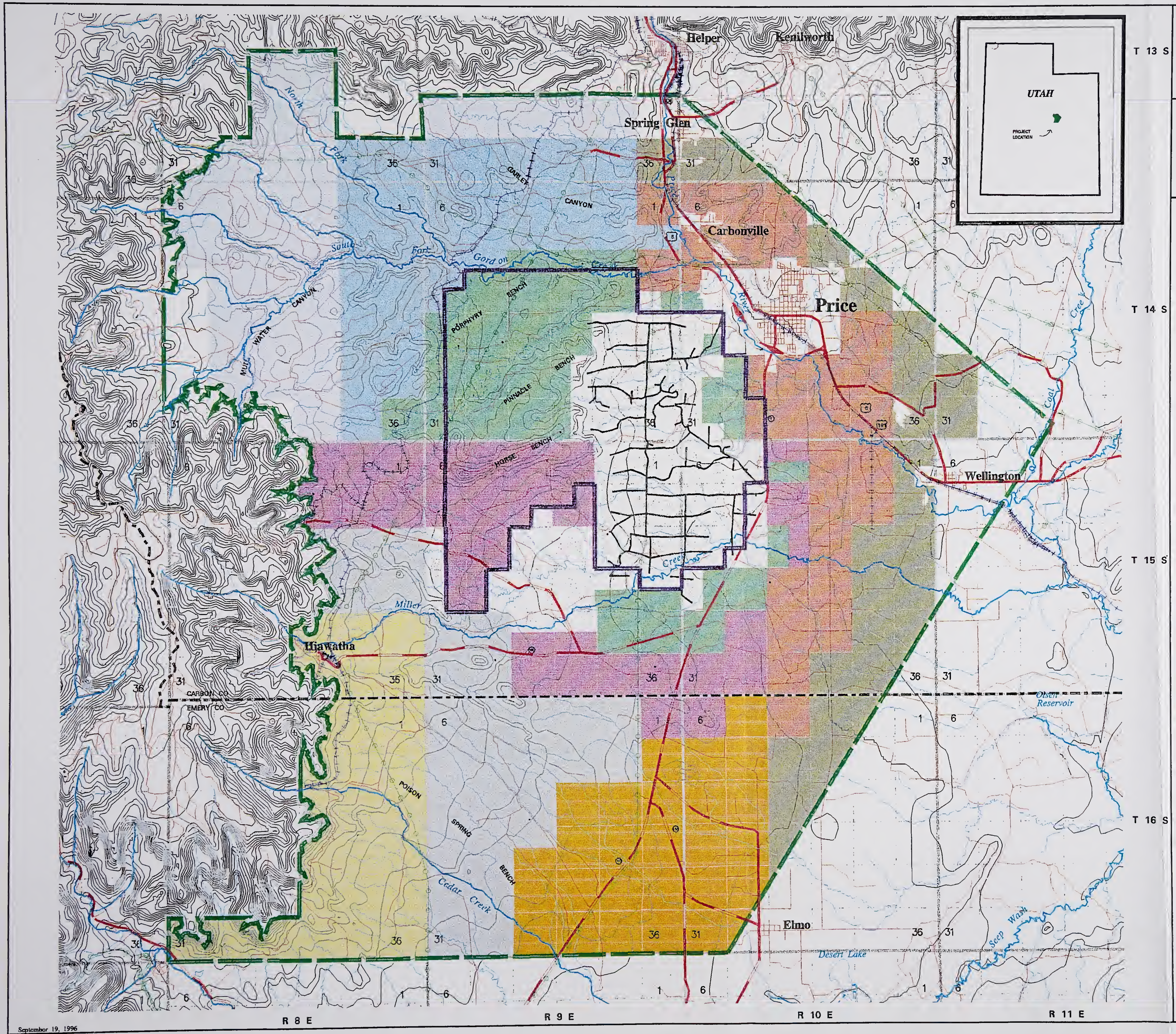
Contour Interval 40 Meters

- Proposed Price CBM EIS Boundary (RGC Project)
- Existing Pipelines/Transmission Lines
- Other Roads; Trails
- Hydrology
- Railroads
- BLM
- State
- UDWR
- Forest Service
- Private
- Urban Areas
- Existing Well
- Proposed Well
- Compressor Site
- Injection Well
- Evaporation Pond Site
- Existing Resource Road Corridor
- Proposed Resource Road Corridor
- Proposed Pipeline Paralleling Existing Road Corridor
- Proposed High Pressure Pipeline
- 12-inch O.D. Interconnect Pipeline
- Existing Paved/Hard Surface Road
- Existing Collector Road Corridor
- Proposed Collector Road Corridor
- Existing Local Road Corridor
- Proposed Local Road Corridor
- Proposed Resource Road Corridor - Raptor Restricted
- Proposed Collector Road Corridor - Seasonal Closure
- Proposed Local Road Corridor - Seasonal Closure
- Proposed Resource Road Corridor - Seasonal Closure
- Proposed Well - Raptor Restricted
- Proposed Well - Seasonal Closure
- Seasonal Closure Gate

0 1 2 3 4
Miles

N

Note: Facilities are not to scale and have been enlarged for visual presentation.
Note: Base map information is from the State of Utah, USGS and the BLM.



PRICE COALBED METHANE EIS

PLATE 3
EXISTING AND PLANNED DEVELOPMENT

LEGEND

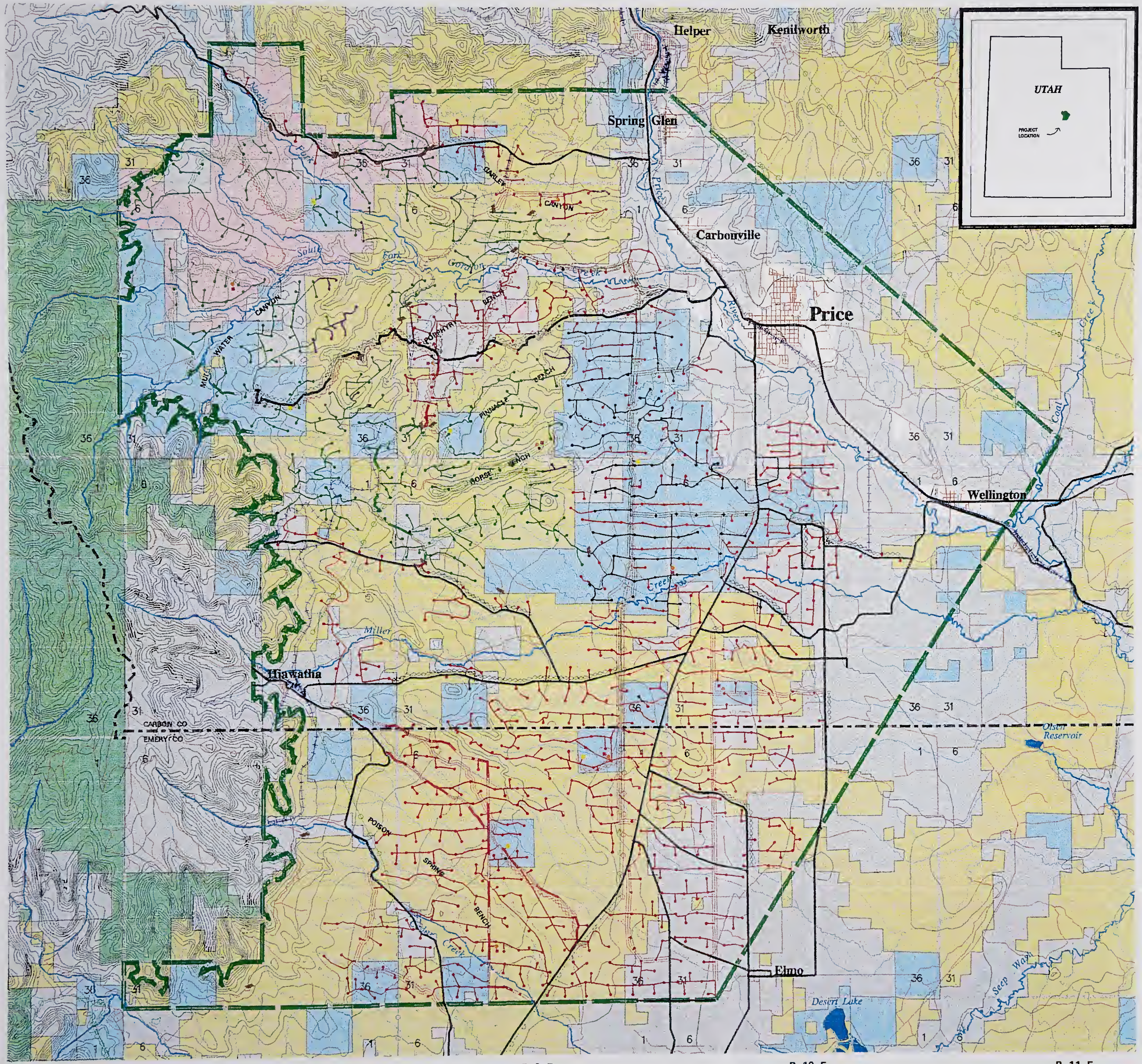
Contour Interval 40 Meters

- Proposed Price CBM EIS Boundary (RGC Project)
- Primary/Secondary Roads
- Other Roads; Trails
- Railroads
- Existing Pipelines/Transmission Lines
- Hydrology
- Existing Resource Road Corridor
- No Further Developement
- YEAR 1
- YEAR 2
- YEAR 3
- YEAR 4
- YEAR 5
- YEAR 6
- YEAR 7
- YEAR 8
- YEAR 9
- Drunkards Wash Federal Unit Boundary

0 1 2 3 4
Miles

N

Note: Base map information is from the State of Utah, USGS and the BLM.



PRICE COALBED METHANE EIS

PLATE 4
ALTERNATIVE A
80 - ACRE WELL SPACING

LEGEND

Contour Interval 40 Meters

- Proposed Price CBM EIS Boundary (RGC Project)
- Existing Pipelines/Transmission Lines
- Other Roads; Trails
- Hydrology
- Railroads

- BLM
- State
- UDWR
- Forest Service
- Private
- Urban Areas

- Existing Well
- Proposed Well
- Compressor Site
- Injection Well
- Evaporation Pond Site

- Existing Resource Road Corridor
- Proposed Resource Road Corridor
- Proposed Pipeline Paralleling Existing Road Corridor
- Proposed High Pressure Pipeline
- 12-inch O.D. Interconnect Pipeline
- Existing Paved/Hard Surface Road
- Existing Collector Road Corridor
- Proposed Collector Road Corridor
- Existing Local Road Corridor
- Proposed Local Road Corridor
- Proposed Resource Road Corridor - Raptor Restricted
- Proposed Collector Road Corridor - Seasonal Closure
- Proposed Local Road Corridor - Seasonal Closure
- Proposed Resource Road Corridor - Seasonal Closure

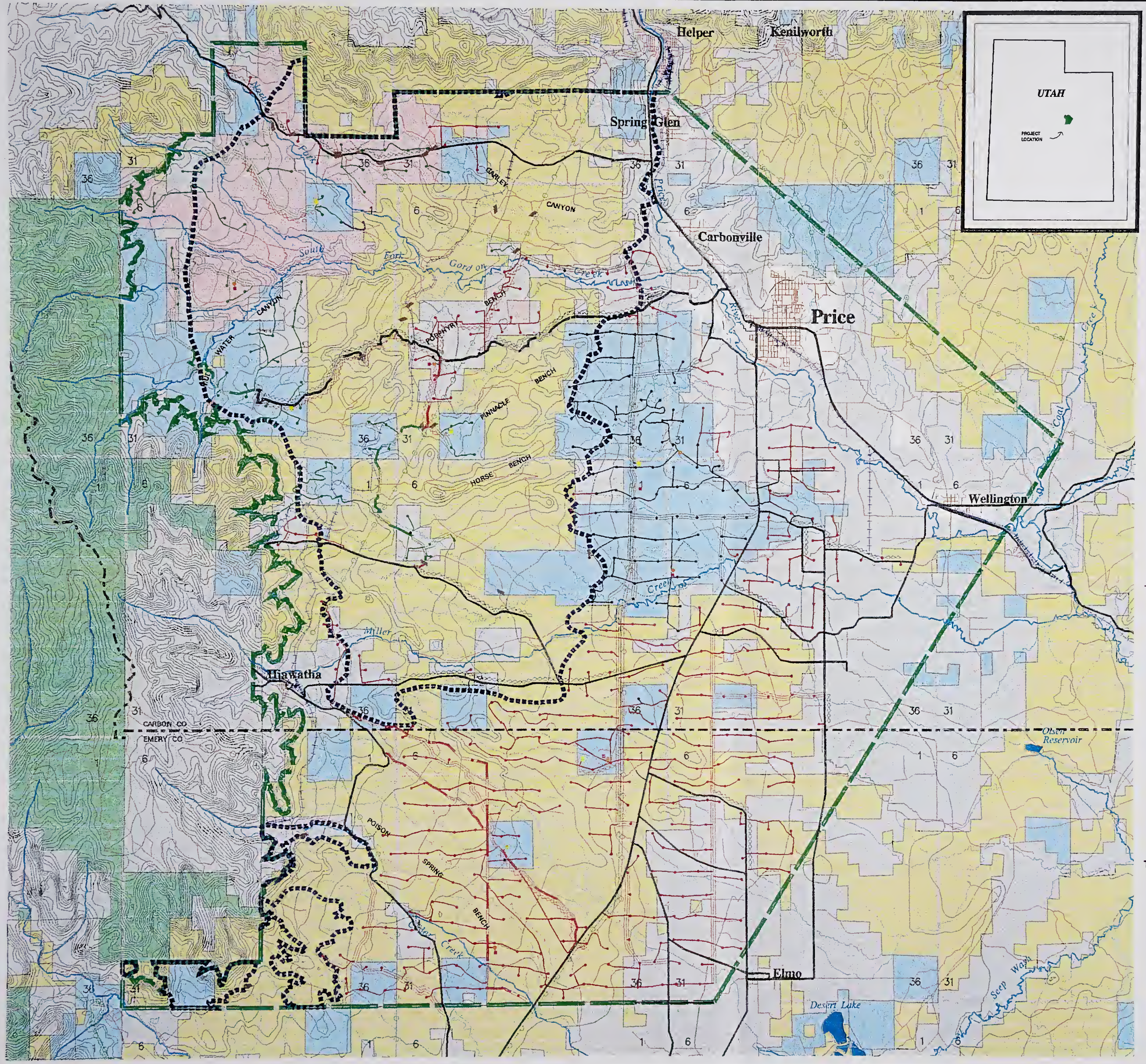
- Proposed Well - Raptor Restricted
- Proposed Well - Seasonal Closure
- Seasonal Closure Gate

0 1 2 3 4
Miles

N

Note: Facilities are not to scale and have been enlarged for visual presentation.
Note: Base map information is from the State of Utah, USGS and the BLM.

September 19, 1996



T 13 S

T 14 S

T 15 S

T 16 S

R 8 E R 9 E R 10 E R 11 E

September 19, 1996

PRICE COALBED METHANE EIS

PLATE 5
ALTERNATIVE B1
CRITICAL AREAS AVOIDANCE
160 - ACRE WELL SPACING

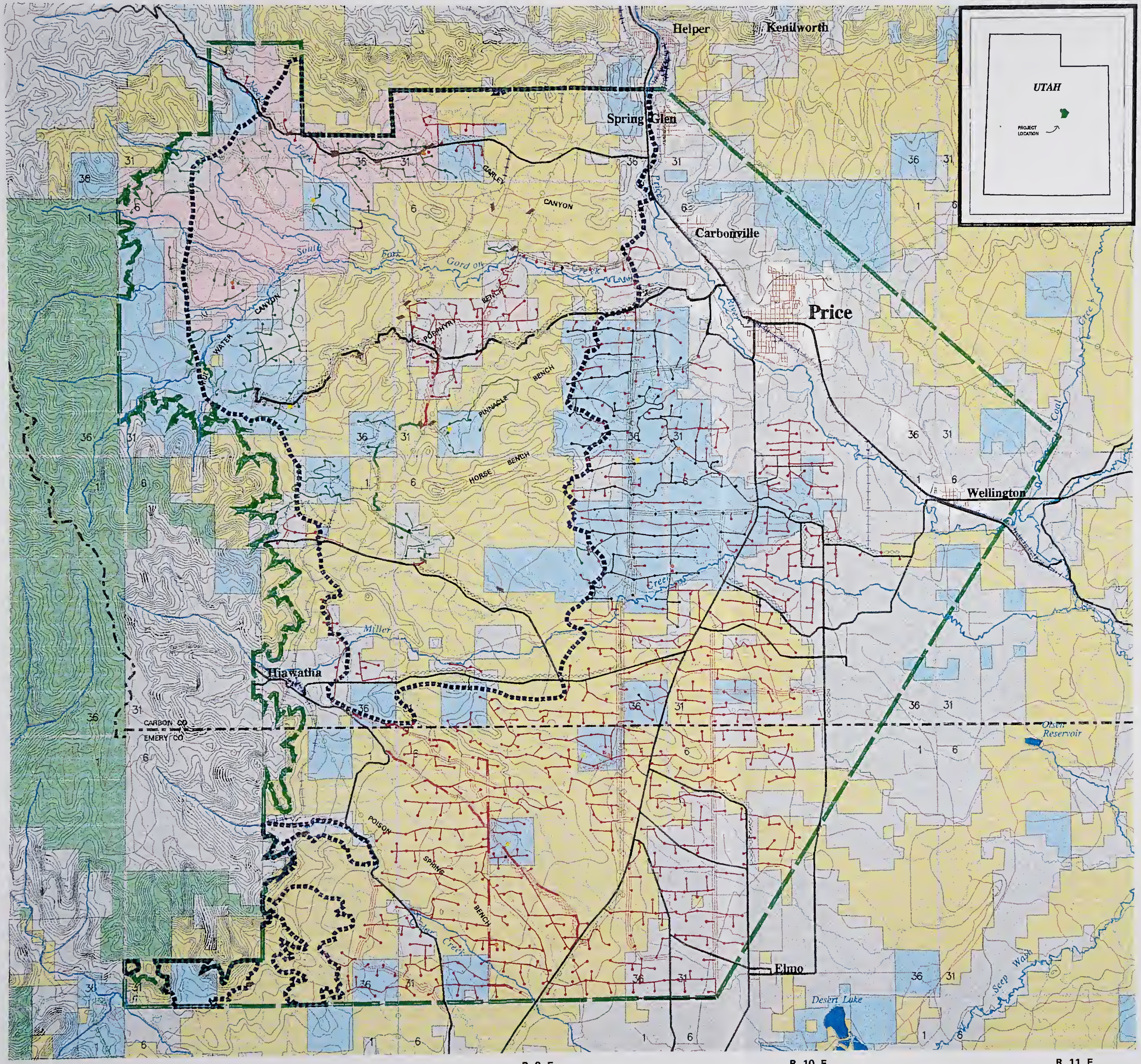
LEGEND

Contour Interval 40 Meters

- Proposed Price CBM EIS Boundary (RGC Project)
- Existing Pipelines/Transmission Lines
- Other Roads; Trails
- Hydrology
- Railroads
- BLM
- State
- UDWR
- Forest Service
- Private
- Urban Areas
- Existing Well
- Proposed Well
- Compressor Site
- Injection Well
- Evaporation Pond Site
- Existing Resource Road Corridor
- Proposed Resource Road Corridor
- Proposed Pipeline Paralleling Existing Road Corridor
- Proposed High Pressure Pipeline
- 12-inch O.D. Interconnect Pipeline
- Critical Wildlife Habitat
- Existing Paved/Hard Surface Road
- Existing Collector Road Corridor
- Proposed Collector Road Corridor
- Existing Local Road Corridor
- Proposed Local Road Corridor
- Proposed Resource Road Corridor - Raptor Restricted
- Proposed Collector Road Corridor - Seasonal Closure
- Proposed Local Road Corridor - Seasonal Closure
- Proposed Resource Road Corridor - Seasonal Closure
- Proposed Well - Raptor Restricted
- Proposed Well - Seasonal Closure
- Seasonal Closure Gate

0 1 2 3 4
Miles

Note: Facilities are not to scale and have been enlarged for visual presentation.
Note: Base map information is from the State of Utah, USGS and the BLM.



September 19, 1996

PRICE COALBED METHANE EIS

PLATE 6
ALTERNATIVE B2
CRITICAL AREAS AVOIDANCE
80 - ACRE WELL SPACING

LEGEND

Contour Interval 40 Meters

- Proposed Price CBM EIS Boundary (RGC Project)
- Existing Pipelines/Transmission Lines
- Other Roads; Trails
- Hydrology
- Railroads

- BLM
- State
- UDWR
- Forest Service
- Private
- Urban Areas

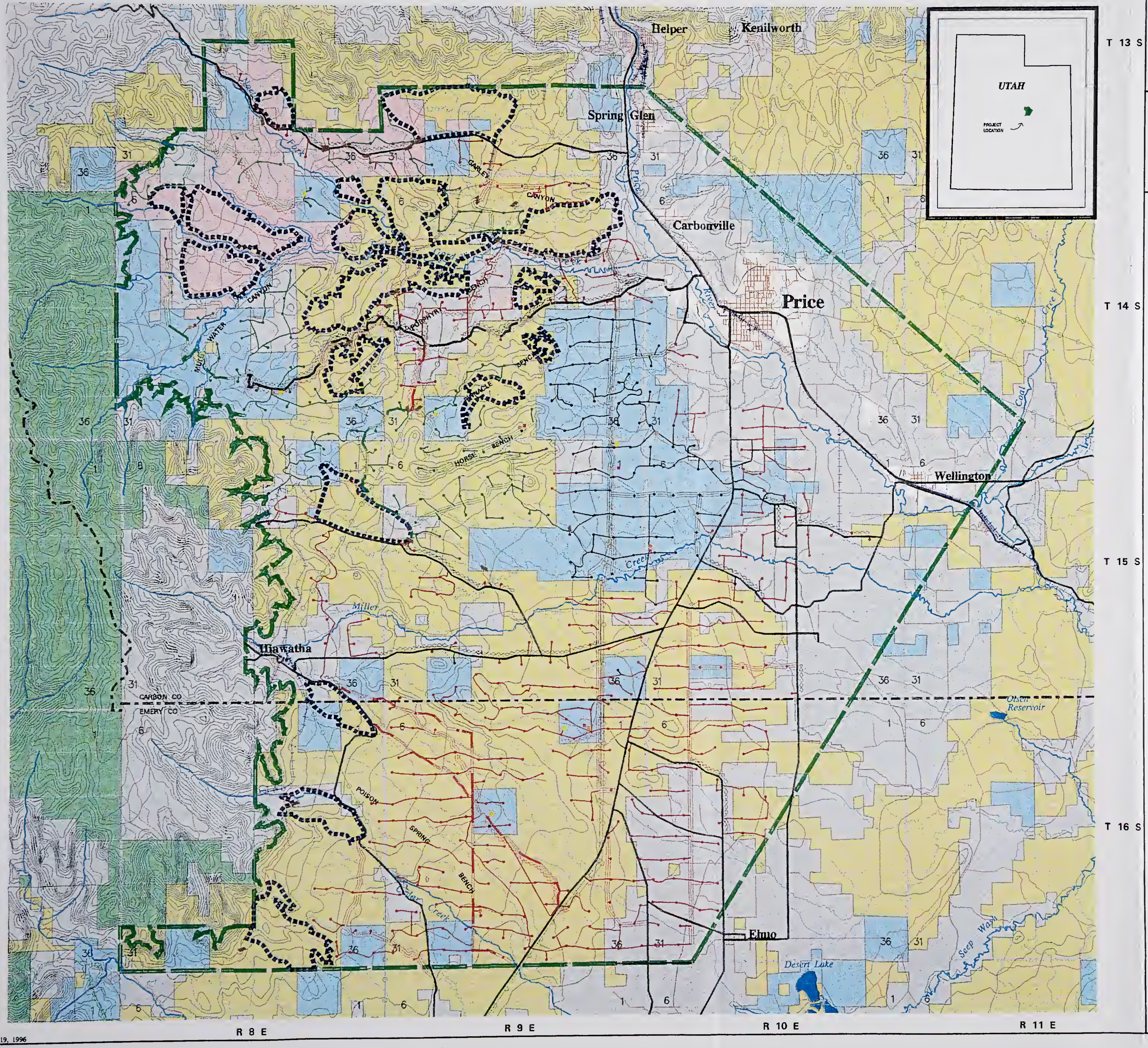
- Existing Well
- Proposed Well
- Compressor Site
- Injection Well
- Evaporation Pond Site

- Existing Resource Road Corridor
- Proposed Resource Road Corridor
- Proposed Pipeline Paralleling Existing Road Corridor
- Proposed High Pressure Pipeline
- 12-inch O.D. Interconnect Pipeline
- Critical Wildlife Habitat
- Existing Paved/Hard Surface Road
- Existing Collector Road Corridor
- Proposed Collector Road Corridor
- Existing Local Road Corridor
- Proposed Local Road Corridor
- Proposed Resource Road Corridor - Raptor Restricted
- Proposed Collector Road Corridor - Seasonal Closure
- Proposed Local Road Corridor - Seasonal Closure
- Proposed Resource Road Corridor - Seasonal Closure

- Proposed Well - Raptor Restricted
- Proposed Well - Seasonal Closure
- Seasonal Closure Gate

0 1 2 3 4
Miles

Note: Facilities are not to scale and have been enlarged for visual presentation.
Note: Base map information is from the State of Utah, USGS and the BLM.



PRICE COALBED METHANE EIS

PLATE 7
BLM PREFERRED ALTERNATIVE (C1)
SECURITY AREAS PROTECTION
160 - ACRE WELL SPACING

LEGEND

Contour Interval 40 Meters

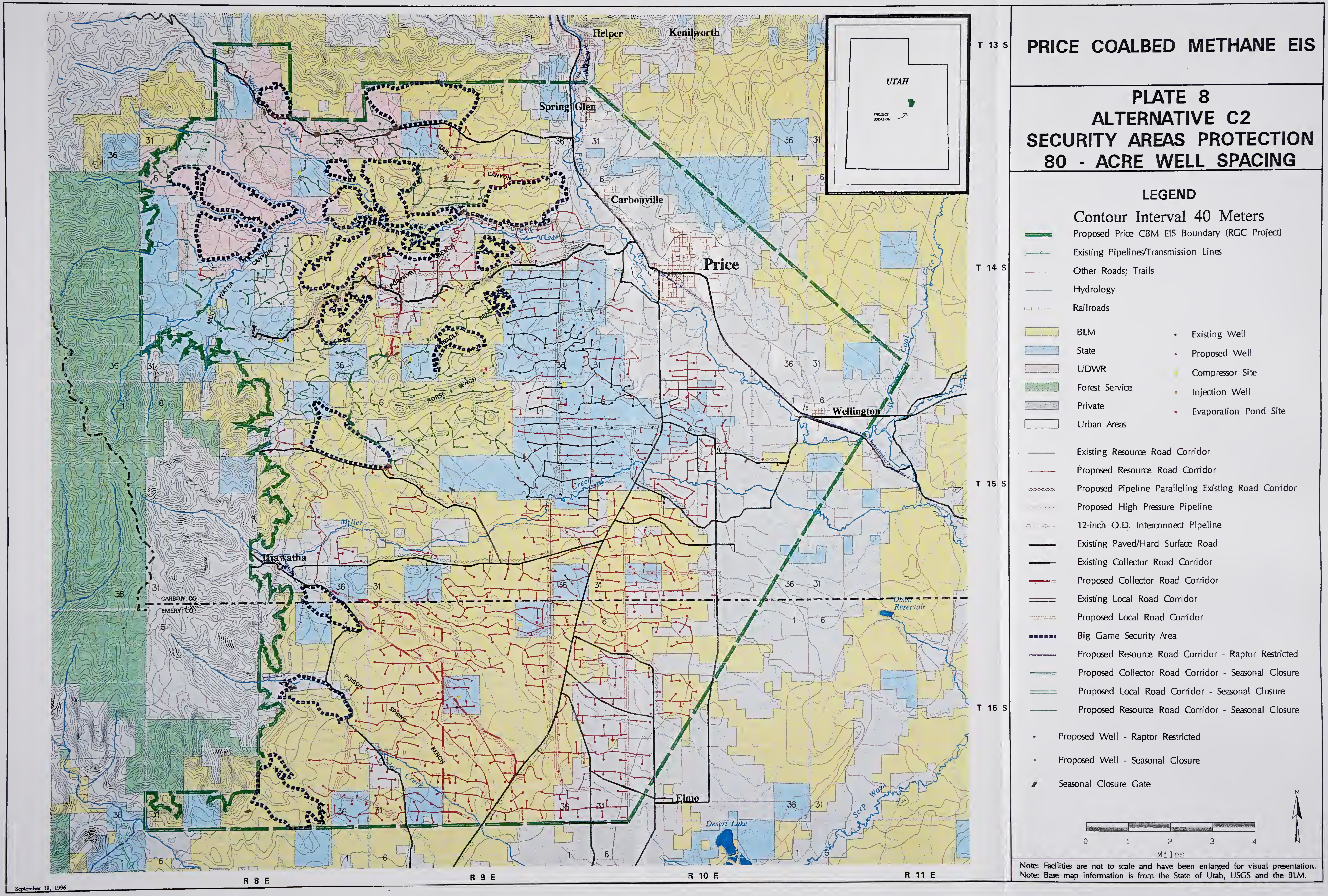
- Proposed Price CBM EIS Boundary (RGC Project)
- Existing Pipelines/Transmission Lines
- Other Roads; Trails
- Hydrology
- Railroads
- BLM
- State
- UDWR
- Forest Service
- Private
- Urban Areas
- Existing Well
- Proposed Well
- Compressor Site
- Injection Well
- Evaporation Pond Site
- Existing Resource Road Corridor
- Proposed Resource Road Corridor
- Proposed Pipeline Paralleling Existing Road Corridor
- Proposed High Pressure Pipeline
- 12-inch O.D. Interconnect Pipeline
- Existing Paved/Hard Surface Road
- Existing Collector Road Corridor
- Proposed Collector Road Corridor
- Existing Local Road Corridor
- Proposed Local Road Corridor
- Big Game Security Area
- Proposed Resource Road Corridor - Raptor Restricted
- Proposed Collector Road Corridor - Seasonal Closure
- Proposed Local Road Corridor - Seasonal Closure
- Proposed Resource Road Corridor - Seasonal Closure
- Proposed Well - Raptor Restricted
- Proposed Well - Seasonal Closure
- Seasonal Closure Gate

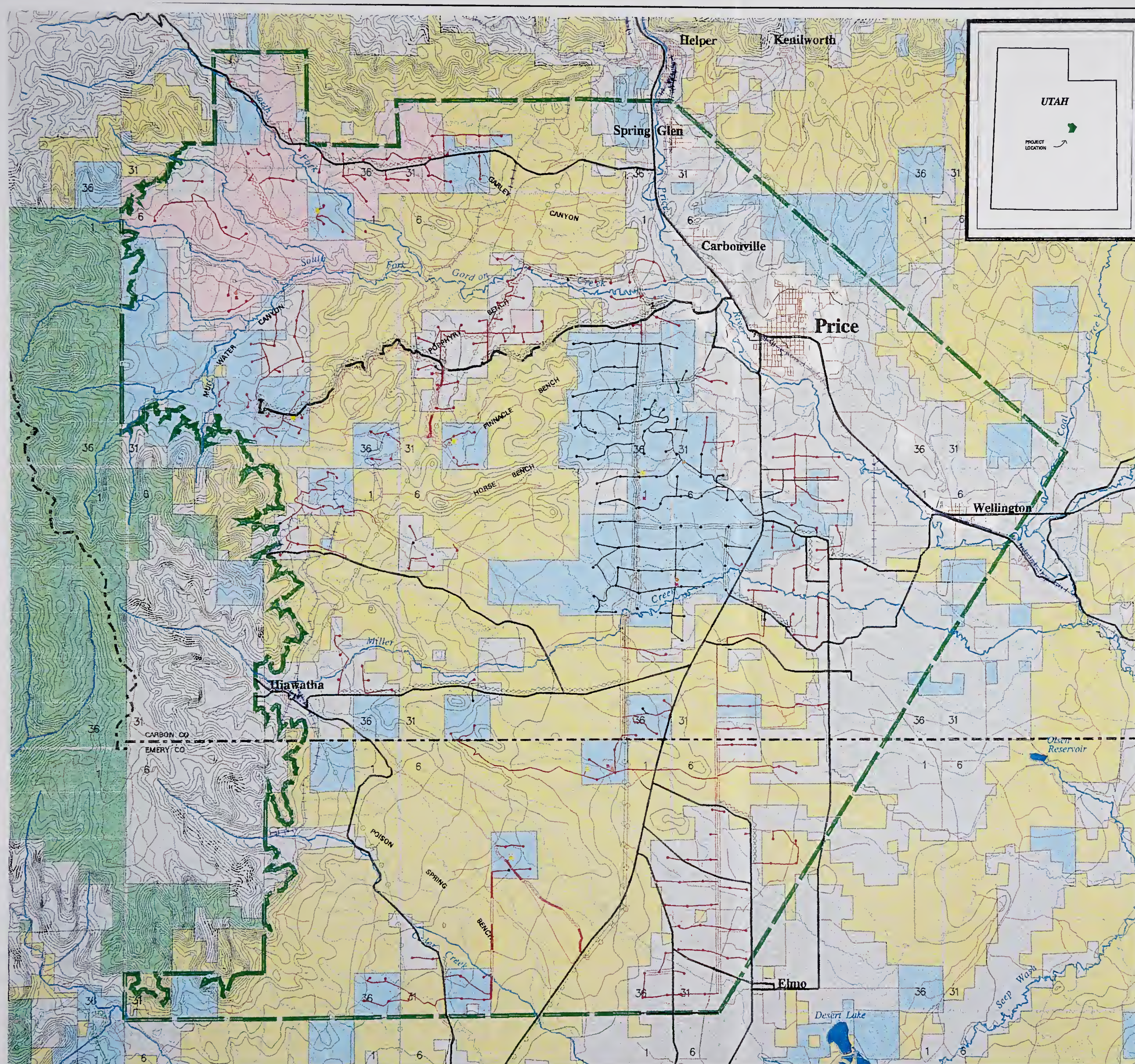
0 1 2 3 4
Miles

N

Note: Facilities are not to scale and have been enlarged for visual presentation.
Note: Base map information is from the State of Utah, USGS and the BLM.

September 19, 1996


PRICE COALBED METHANE EIS
PLATE 8
ALTERNATIVE C2
SECURITY AREAS PROTECTION
80 - ACRE WELL SPACING
LEGEND
Contour Interval 40 Meters
Proposed Price CBM EIS Boundary (RGC Project)
Existing Pipelines/Transmission Lines
Other Roads; Trails
Hydrology
Railroads
BLM
State
UDWR
Forest Service
Private
Urban Areas
Existing Well
Proposed Well
Compressor Site
Injection Well
Evaporation Pond Site
Existing Resource Road Corridor
Proposed Resource Road Corridor
Proposed Pipeline Paralleling Existing Road Corridor
Proposed High Pressure Pipeline
12-inch O.D. Interconnect Pipeline
Existing Paved/Hard Surface Road
Existing Collector Road Corridor
Proposed Collector Road Corridor
Existing Local Road Corridor
Proposed Local Road Corridor
Big Game Security Area
Proposed Resource Road Corridor - Raptor Restricted
Proposed Collector Road Corridor - Seasonal Closure
Proposed Local Road Corridor - Seasonal Closure
Proposed Resource Road Corridor - Seasonal Closure
Proposed Well - Raptor Restricted
Proposed Well - Seasonal Closure
Seasonal Closure Gate
0 1 2 3 4
Miles
N
Note: Facilities are not to scale and have been enlarged for visual presentation.
Note: Base map information is from the State of Utah, USGS and the BLM.
UTAH
Helper
Kenilworth
Spring Glen
Carbonville
Price
Wellington
Hiawatha
Elmo
Desert Lake
Olsen Reservoir
CARBON CO
EMERY CO
T 13 S
T 14 S
T 15 S
T 16 S
R 8 E
R 9 E
R 10 E
R 11 E
September 19, 1996



PRICE COALBED METHANE EIS

PLATE 9
NO ACTION

LEGEND

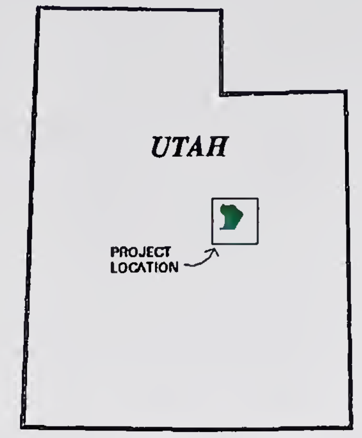
Contour Interval 40 Meters

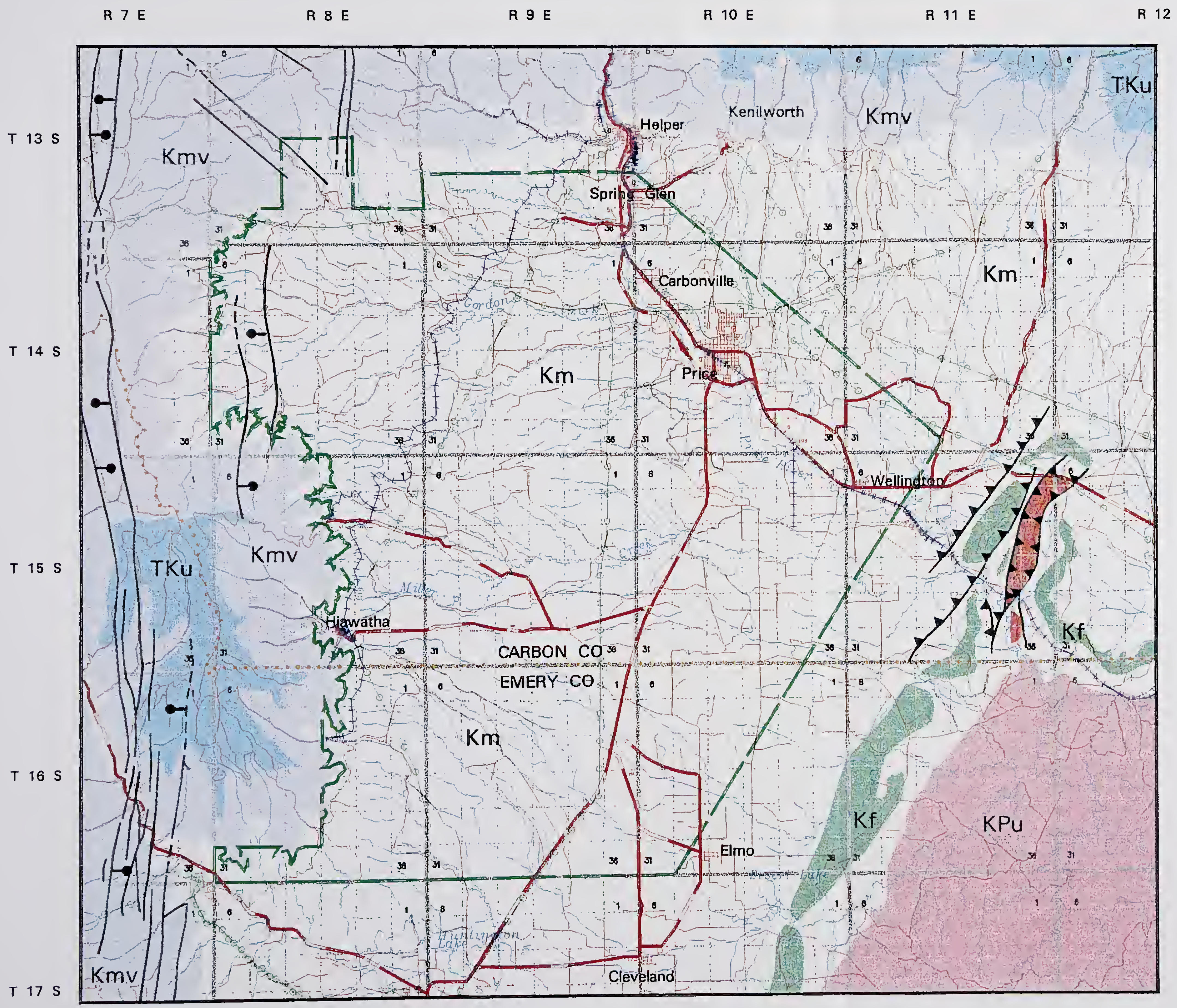
- Proposed Price CBM EIS Boundary (RGC Project)
- Existing Pipelines/Transmission Lines
- Other Roads; Trails
- Hydrology
- Railroads
- BLM
- State
- UDWR
- Forest Service
- Private
- Urban Areas
- Existing Well
- Proposed Well
- Compressor Site
- Injection Well
- Evaporation Pond Site
- Existing Resource Road Corridor
- Proposed Resource Road Corridor
- Proposed Pipeline Paralleling Existing Road Corridor
- Proposed High Pressure Pipeline
- 12-inch O.D. Interconnect Pipeline
- Existing Paved/Hard Surface Road
- Existing Collector Road Corridor
- Proposed Collector Road Corridor
- Existing Local Road Corridor
- Proposed Local Road Corridor

0 1 2 3 4
Miles

Note: Facilities are not to scale and have been enlarged for visual presentation.
Note: Base map information is from the State of Utah, USGS and the BLM.

September 19, 1996





PRICE COALBED METHANE EIS

PLATE 10
SURFACE GEOLOGY

LEGEND
SCALE 1:250,000

Proposed Price CBM EIS Boundary (RGC Project)

Other Roads; Trails

Railroads

Existing Pipelines/Transmission Lines

Hydrology

N

TKu — Tertiary and Cretaceous Rocks, undivided (Green River, Colton and North Horn Fms.)

Kmv — Mesaverde Group, undivided (Price River Fm. to Star Point Ss.)

Km — Mancos Shale, undivided (Masuk* to Tununk Members)

Kf — Ferron Sandstone Member of Mancos Shale

KPu — Cretaceous and Pennsylvanian Rocks, undivided (Dakota Ss. to Hermosa Fm.)

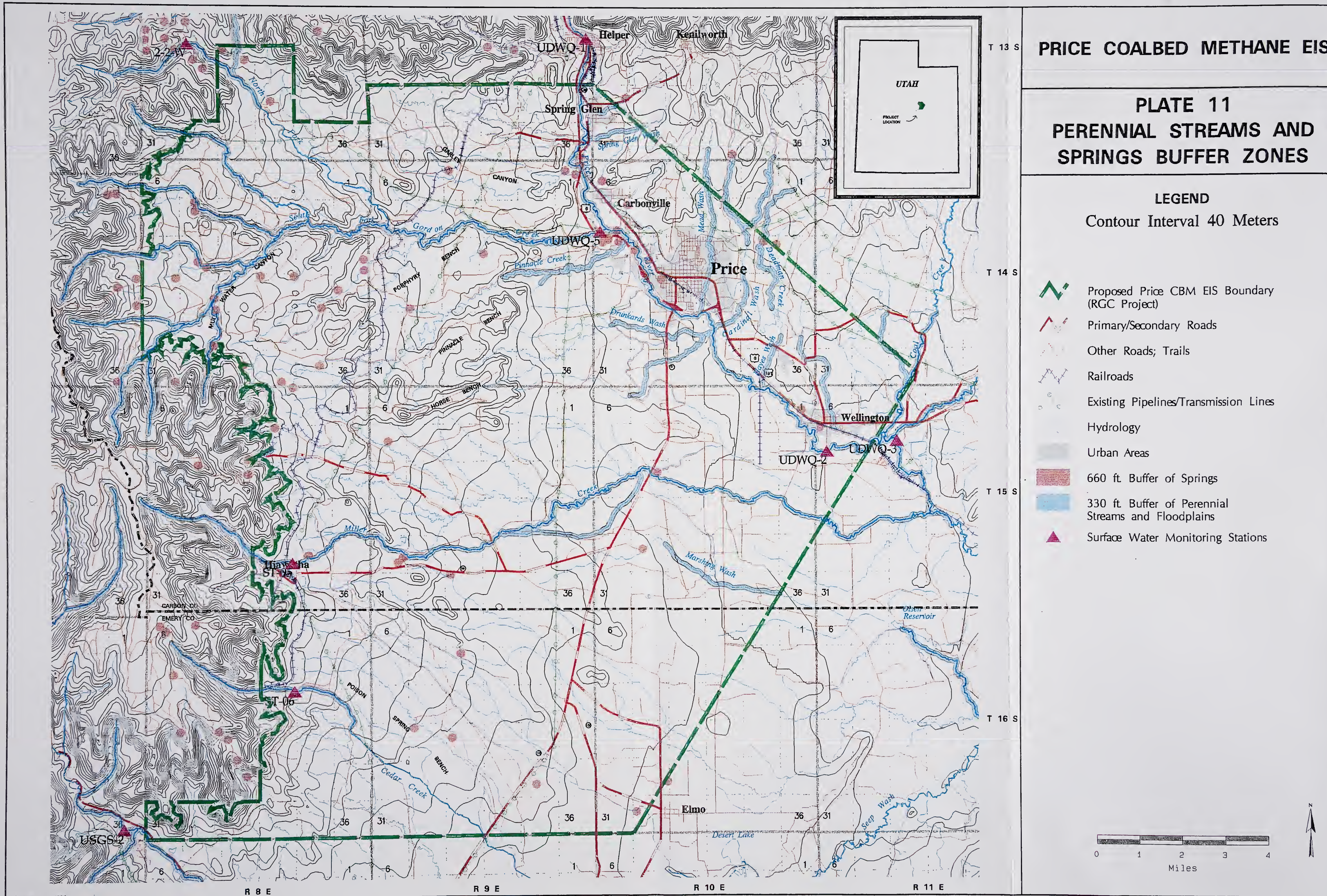
Older Geologic Units

High-Angle Fault, approximately located, bar and ball on downthrown side

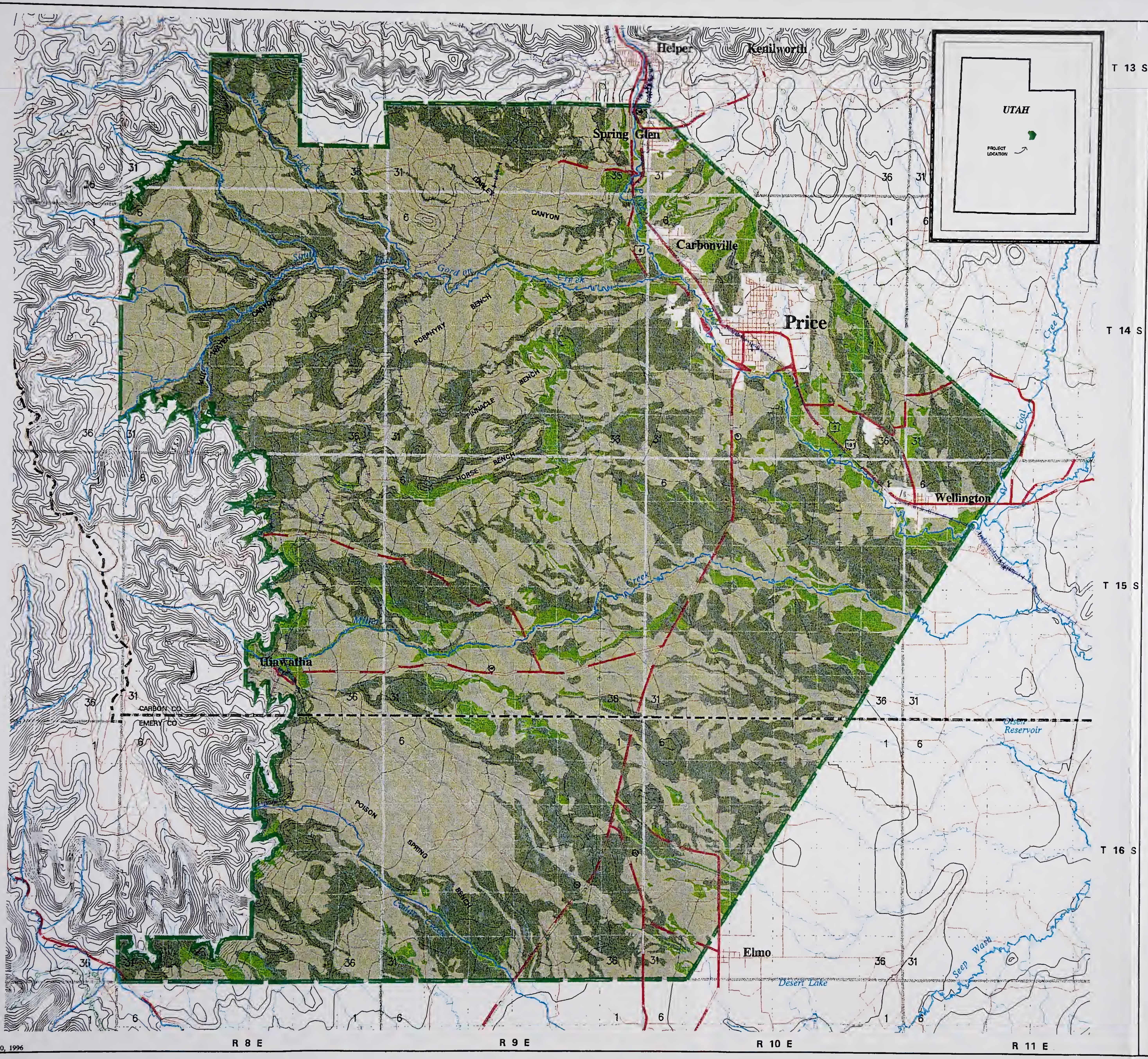
Thrust Fault, barbs on overthrust sheet

Geology from: Waddell et. al., 1981; and Lines and Morrissey, 1983.

* Masuk Shale is currently termed upper part of the Blue Gate Shale.



PRICE COALBED METHANE EIS
PLATE 11
PERENNIAL STREAMS AND SPRINGS BUFFER ZONES
LEGEND
Contour Interval 40 Meters
Proposed Price CBM EIS Boundary (RGC Project)
Primary/Secondary Roads
Other Roads; Trails
Railroads
Existing Pipelines/Transmission Lines
Hydrology
Urban Areas
660 ft. Buffer of Springs
330 ft. Buffer of Perennial Streams and Floodplains
Surface Water Monitoring Stations
0
1
2
3
4
Miles
UTAH
PROJECT LOCATION
Helper
Kenilworth
UDWQ-1
Spring Glen
Carbonville
UDWQ-5
Price
Wellington
UDWQ-2
UDWQ-3
Elmo
Desert Lake
Olsen Reservoir
2-2-W
ST-06
USGS-2
Pinnacle Creek
Drunkards Wash
Marshing Wash
Cedar Creek
Miller
CARBON CO
EMERY CO
T 13 S
T 14 S
T 15 S
T 16 S
R 8 E
R 9 E
R 10 E
R 11 E
September 11, 1996



PRICE COALBED METHANE EIS

PLATE 12
SOIL EROSION POTENTIAL

LEGEND

Contour Interval 40 Meters

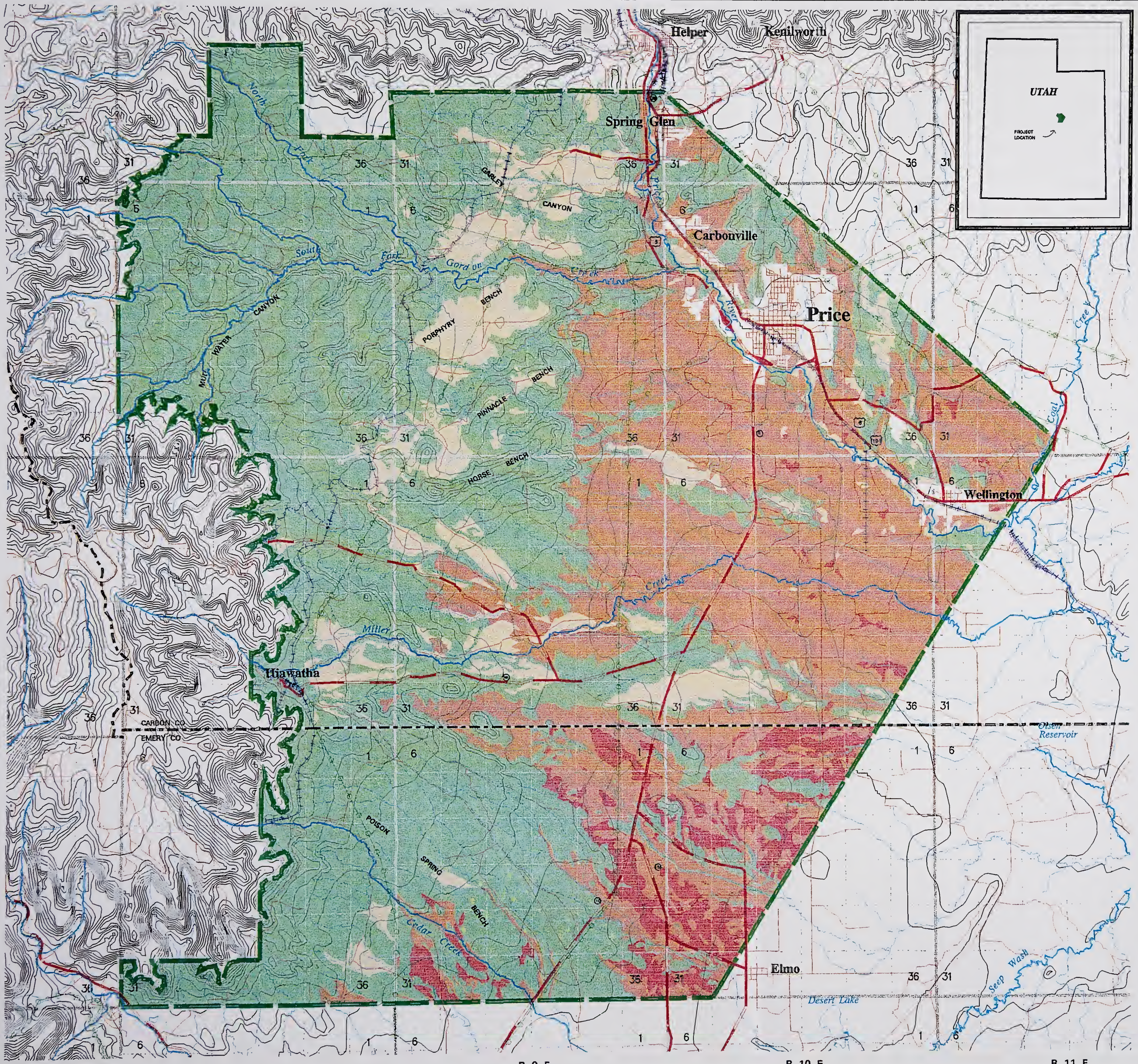
- Proposed Price CBM EIS Boundary (RGC Project)
- Primary/Secondary Roads
- Other Roads; Trails
- Railroads
- Existing Pipelines/Transmission Lines
- Hydrology

- Urban Areas
- High water erosion potential
- Moderate water erosion potential
- Low water erosion potential

0 1 2 3 4
Miles

Source: USDA, SCS, 1970 and 1988.

September 10, 1996



PRICE COALBED METHANE EIS

PLATE 13
SOIL SALINITY

LEGEND

Contour Interval 40 Meters

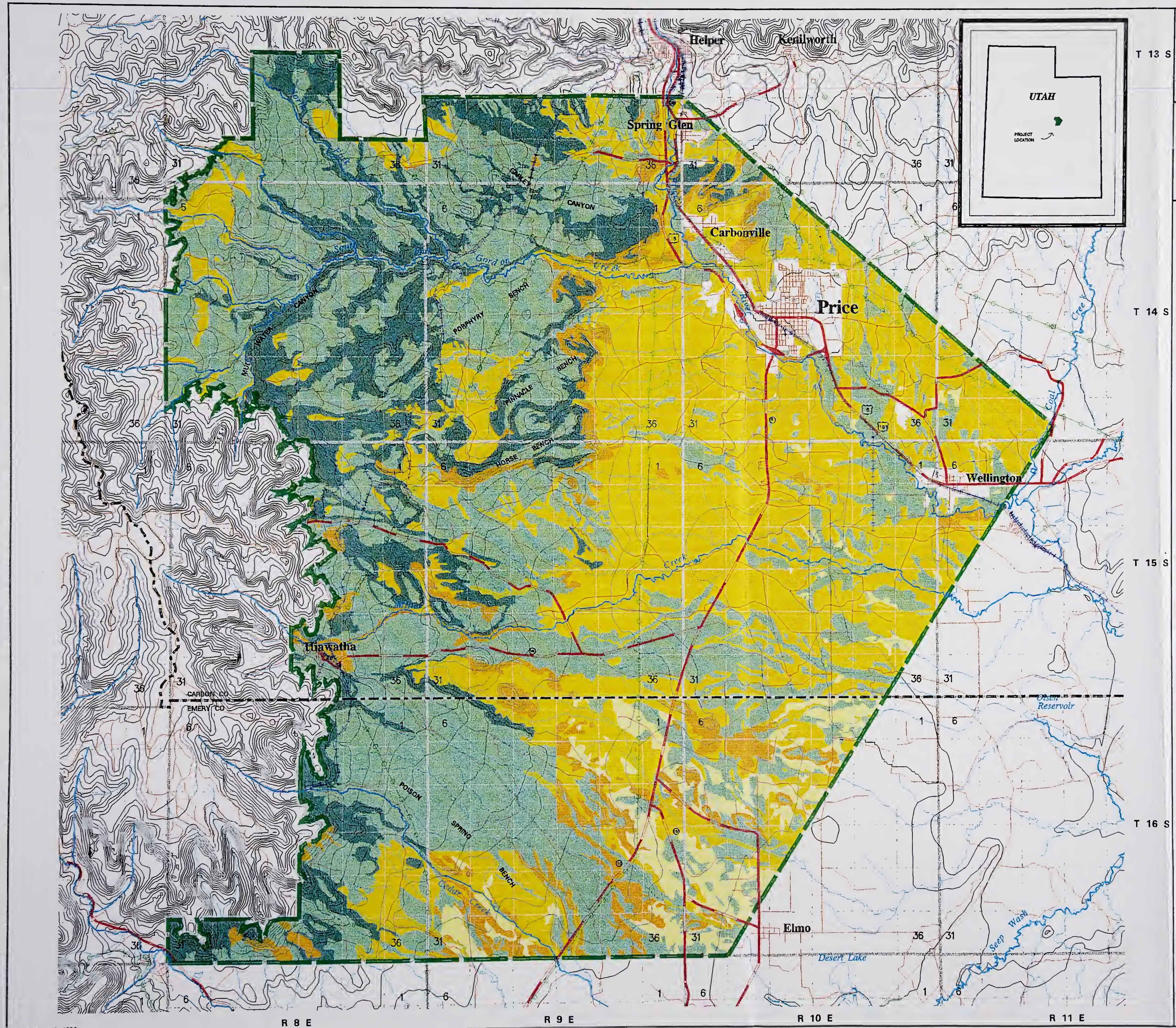
- Proposed Price CBM EIS Boundary (RGC Project)
- Primary/Secondary Roads
- Other Roads; Trails
- Railroads
- Existing Pipelines/Transmission Lines
- Hydrology

- Urban Areas
- Very High salinity (> 16 mmhos/cm)
- High Salinity (8 - 16 mmhos/csm)
- Moderate salinity (4 - 8 mmhos/cm)
- Low salinity (< 4 mmhos/cm)

0 1 2 3 4
Miles

Source: USDA, SCS, 1970 and 1988.

September 10, 1996



September 10, 1996

PRICE COALBED METHANE EIS

PLATE 14
RECLAMATION MATERIAL QUALITY

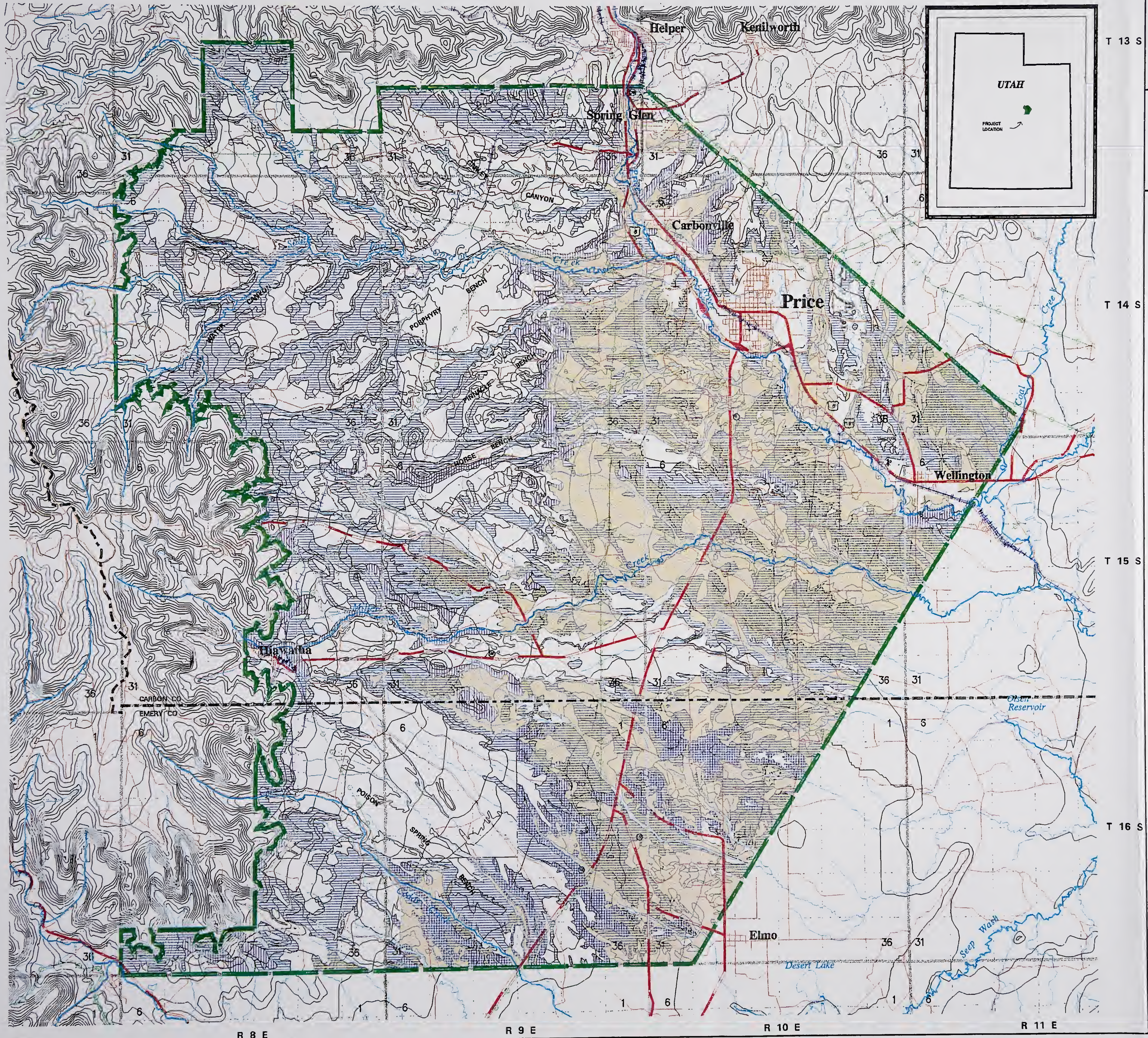
LEGEND

Contour Interval 40 Meters

- Proposed Price CBM EIS Boundary (RGC Project)
- Primary/Secondary Roads
- Other Roads; Trails
- Railroads
- Existing Pipelines/Transmission Lines
- Hydrology
- Urban Areas
- Unsuitable reclamation material
- Poor quality reclamation material - Gullied Lands
- Poor quality reclamation material - Salinity
- Fair quality reclamation material
- Fair to good quality reclamation material

0 1 2 3 4
Miles

Source: USDA, SCS, 1970 and 1988.



PRICE COALBED METHANE EIS

PLATE 15
SOIL CONSTRAINTS OVERLAP

LEGEND

Contour Interval 40 Meters

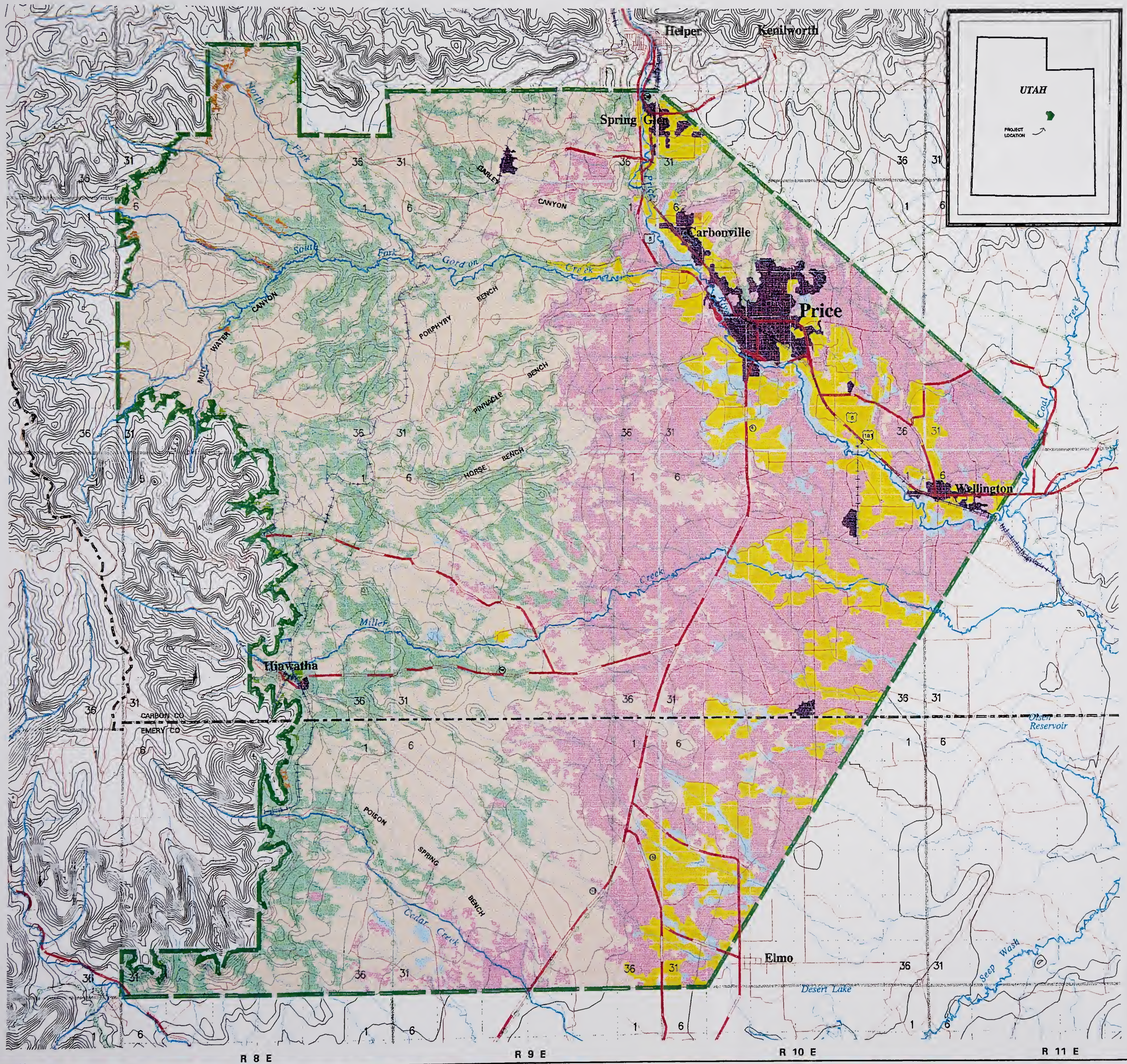
- Proposed Price CBM EIS Boundary (RGC Project)
- Primary/Secondary Roads
- Other Roads; Trails
- Railroads
- Existing Pipelines/Transmission Lines
- Hydrology
- Suitable
- Urban Areas
- High Salinity
- High erosion
- Unsuitable reclamation material

0 1 2 3 4
Miles

N

Source: USDA, SCS, 1970 and 1988.

September 10, 1996



PRICE COALBED METHANE EIS

PLATE 16
VEGETATION

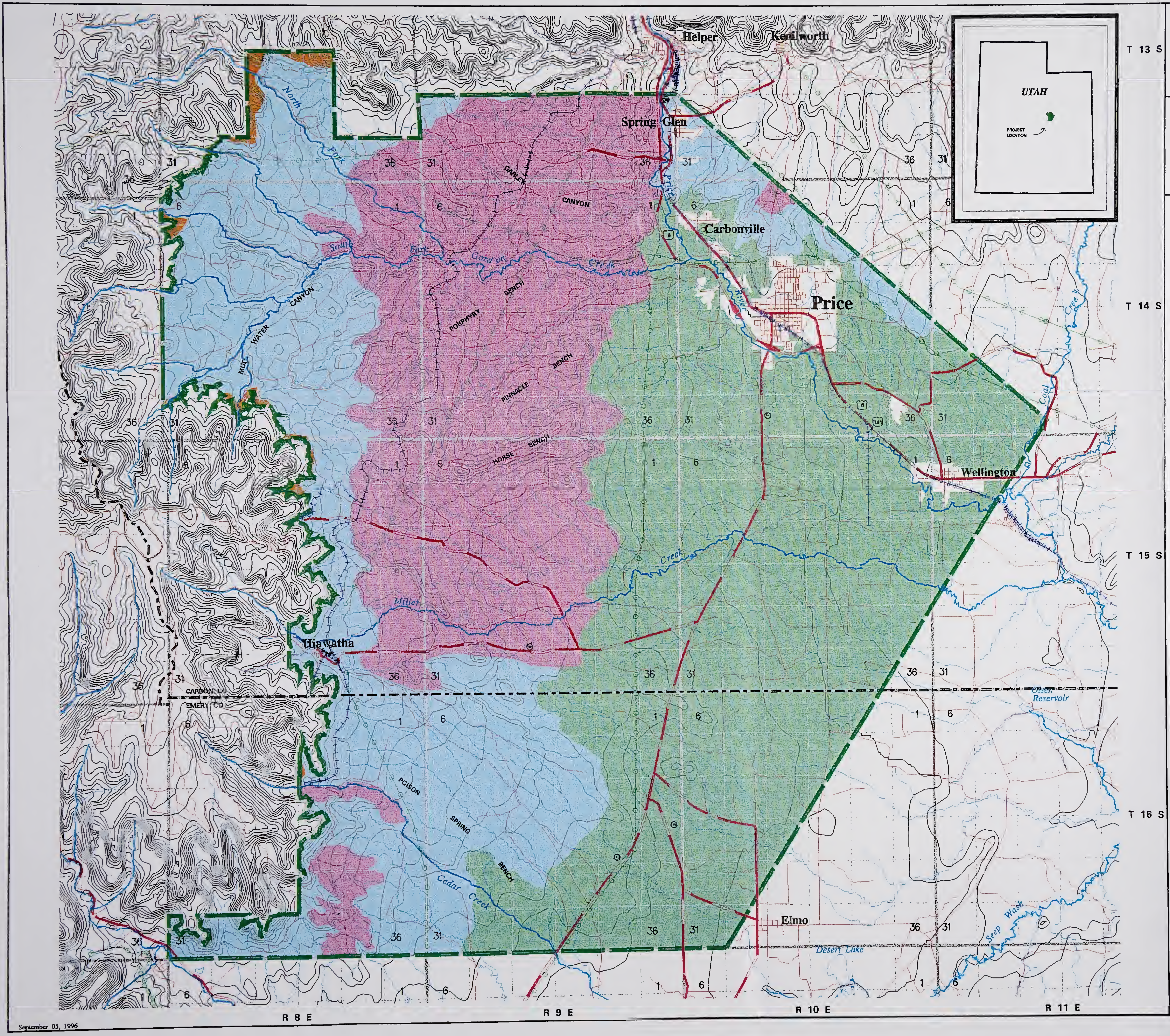
LEGEND

Contour Interval 40 Meters

- Proposed Price CBM EIS Boundary (RGC Project)
- Primary/Secondary Roads
- Other Roads; Trails
- Railroads
- Existing Pipelines/Transmission Lines
- Hydrology
- Water
- Montane/Sub-alpine Forest
- Pinyon/Juniper
- Mountain Shrub
- Sagebrush/Grass
- Barren
- Riparian/Wetland
- Agriculture
- Urban
- Salt Desert

0 1 2 3 4
Miles

Source: State of Utah Automated Geographic Reference Service, and aerial photography interpretation.



PRICE COALBED METHANE EIS

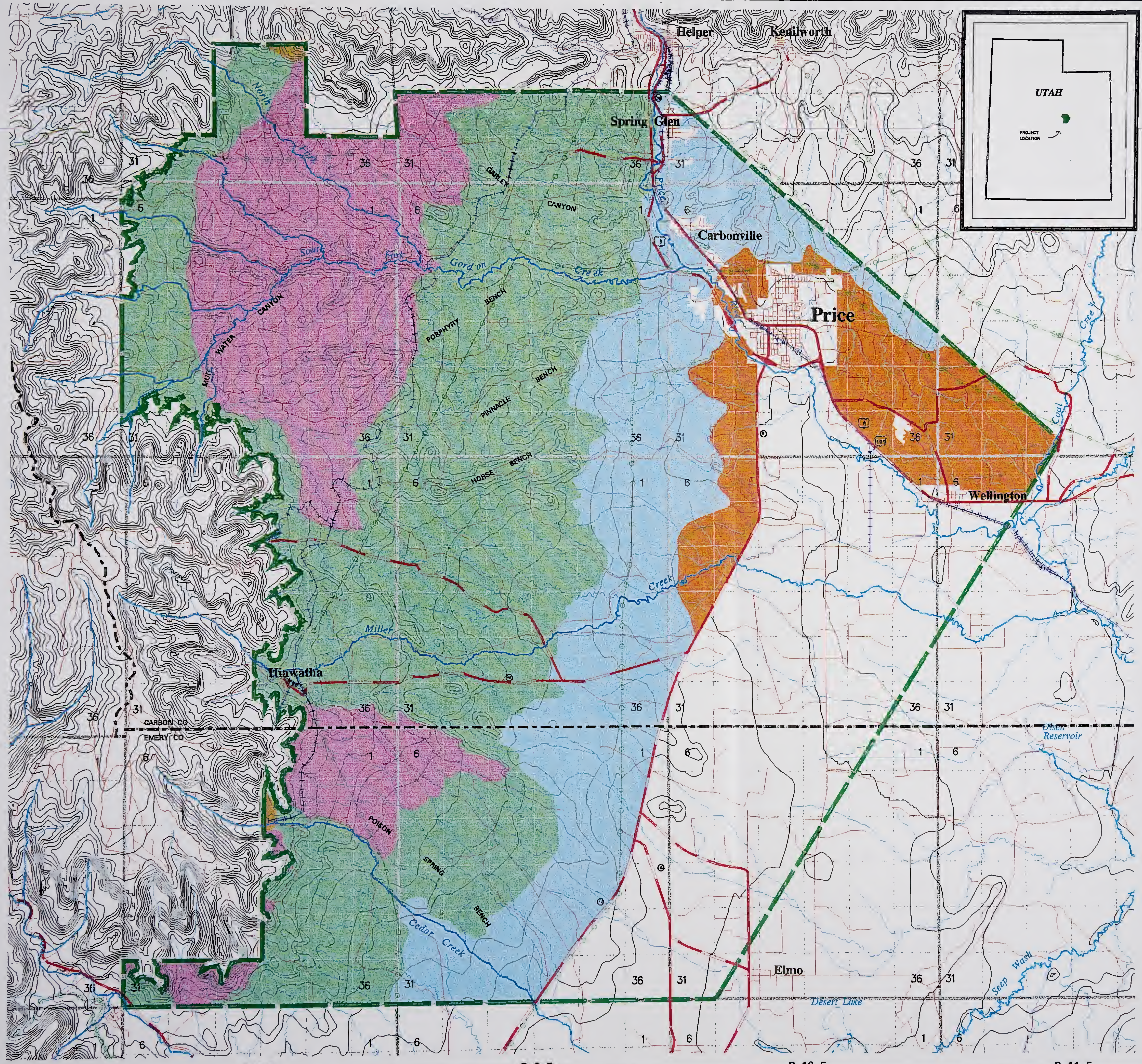
PLATE 17
MULE DEER HABITAT

LEGEND

Contour Interval 40 Meters

- Proposed Price CBM EIS Boundary (RGC Project)
- Primary/Secondary Roads
- Other Roads; Trails
- Railroads
- Existing Pipelines/Transmission Lines
- Hydrology
- Critical Summer Habitat
- Critical Winter Habitat
- High Value Winter Habitat
- Limited Value Yearlong Habitat
- Non-Habitat/Urban

Source: BLM Price River/San Rafael Resource Area



PRICE COALBED METHANE EIS

PLATE 18
ELK HABITAT

LEGEND

Contour Interval 40 Meters

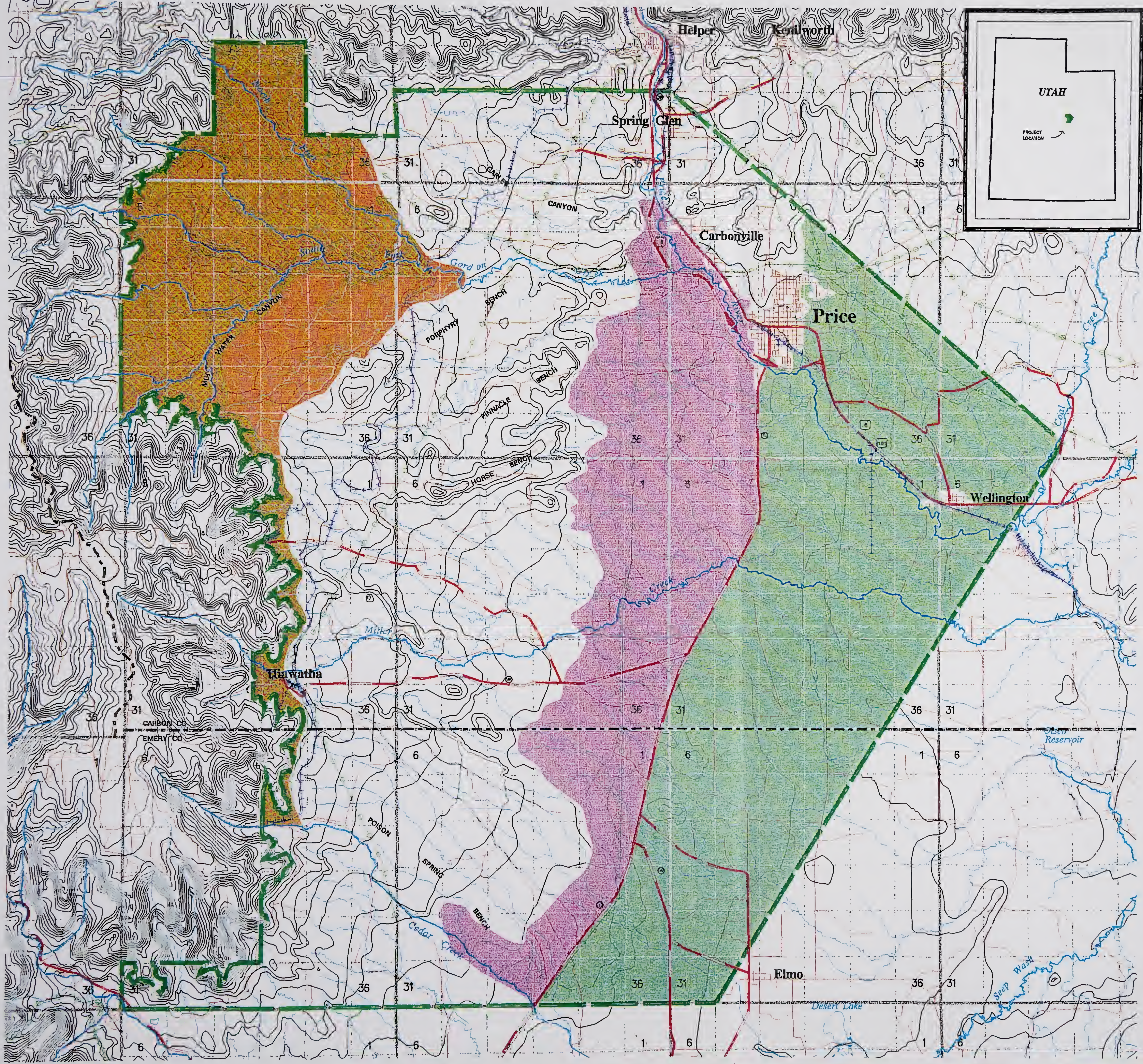
- Proposed Price CBM EIS Boundary (RGC Project)
- Primary/Secondary Roads
- Other Roads; Trails
- Railroads
- Existing Pipelines/Transmission Lines
- Hydrology
- Critical Summer Habitat
- Critical Winter Habitat
- Critical Yearlong Habitat
- High Value Winter Habitat
- Substantial Value Winter Habitat
- Limited Value Winter Habitat
- Non-Habitat/Urban

0 1 2 3 4
Miles

Source: BLM Price River/San Rafael Resource Area

PRICE COALBED METHANE EIS

PLATE 19
BEAR, ANTELOPE AND MOOSE HABITAT



LEGEND

Contour Interval 40 Meters

- Proposed Price CBM EIS Boundary (RGC Project)
- Primary/Secondary Roads
- Other Roads; Trails
- Railroads
- Existing Pipelines/Transmission Lines
- Hydrology
- Non-Habitat/Urban
- Bear High Value Yearlong Habitat
- Antelope Potential Yearlong Habitat
- Antelope High Value Yearlong Habitat
- Moose Limited Value Winter Habitat

0 1 2 3 4
Miles

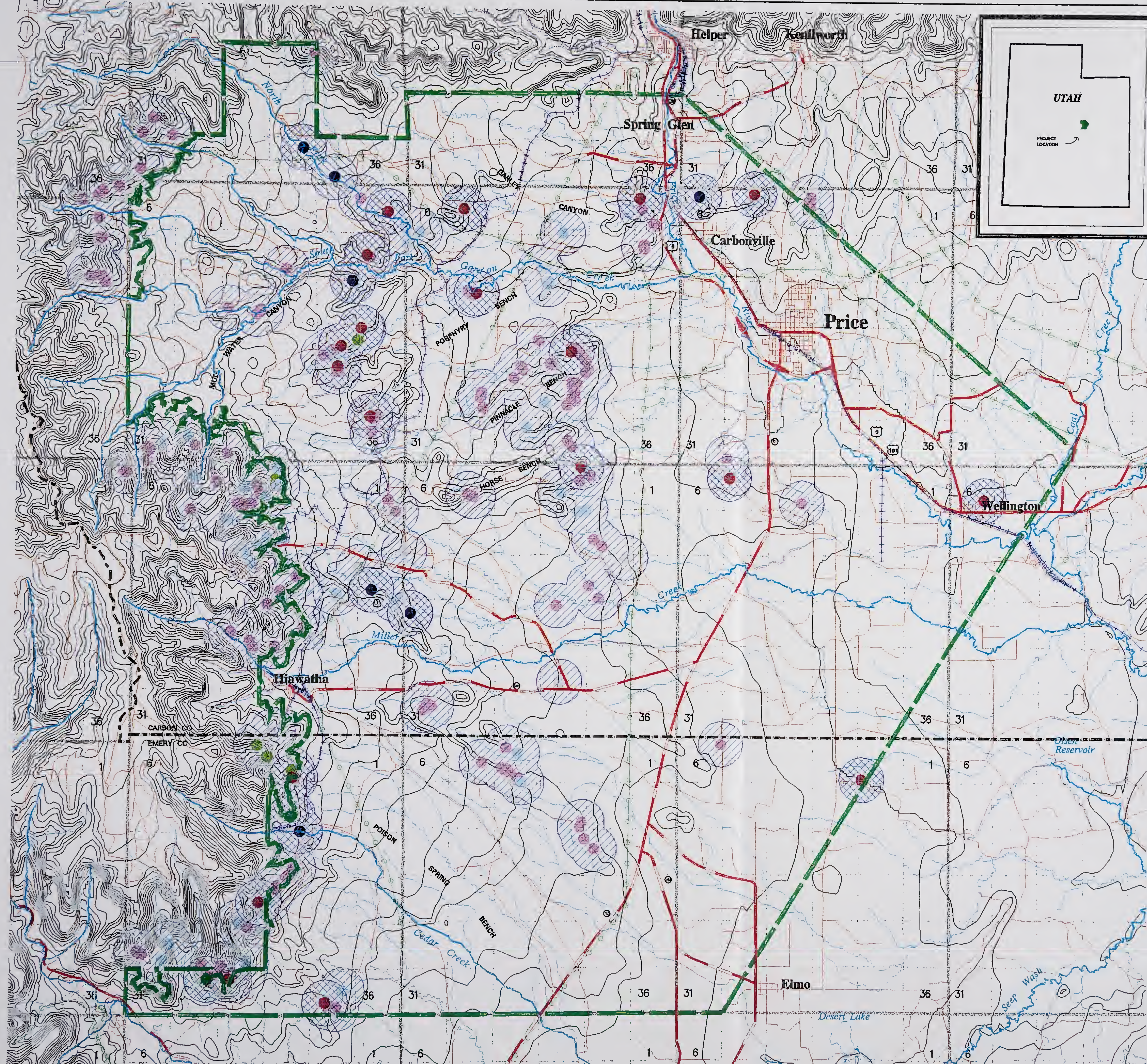
N

Source: BLM Price River/San Rafael Resource Area.

September 05, 1996

PRICE COALBED METHANE EIS

PLATE 20
RAPTOR SITES



LEGEND

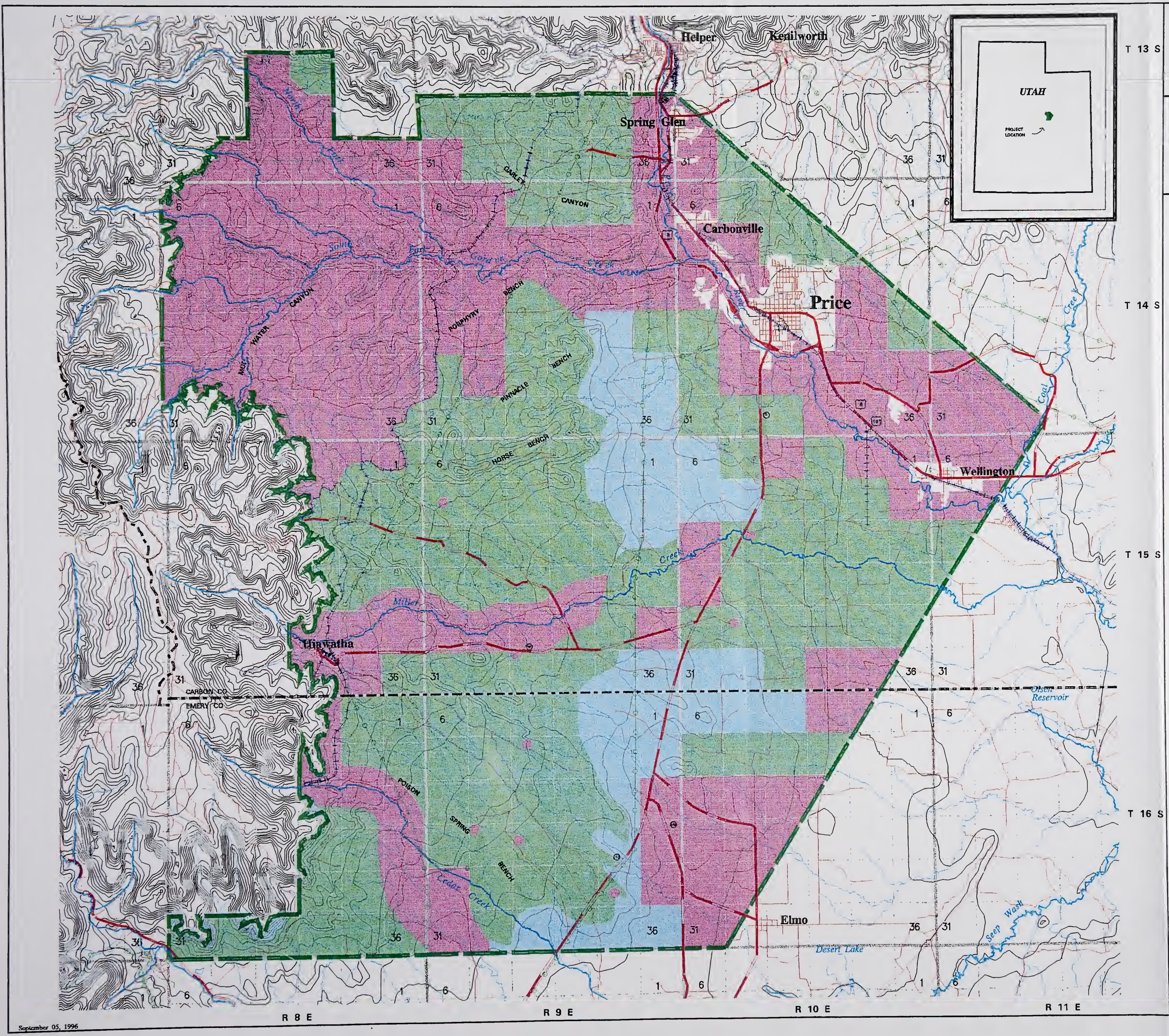
Contour Interval 40 Meters

- Proposed Price CBM EIS Boundary (RGC Project)
- Primary/Secondary Roads
- Other Roads; Trails
- Railroads
- Existing Pipelines/Transmission Lines
- Hydrology
- Nests Active 1993 - 1995
- Historic Nests 1981 - 1992
- Golden Eagle
- Prairie Falcon
- Ferruginous Hawk
- Other Raptors
- Historic Golden Eagle sites
- Historic Prairie Falcon sites
- Historic Ferruginous Hawk sites
- Historic Other Raptor sites

0 1 2 3 4
Miles

Source: Avocet Consulting, 1995.

September 10, 1996



PRICE COALBED METHANE EIS

PLATE 21
CULTURAL RESOURCES SENSITIVITY AREAS

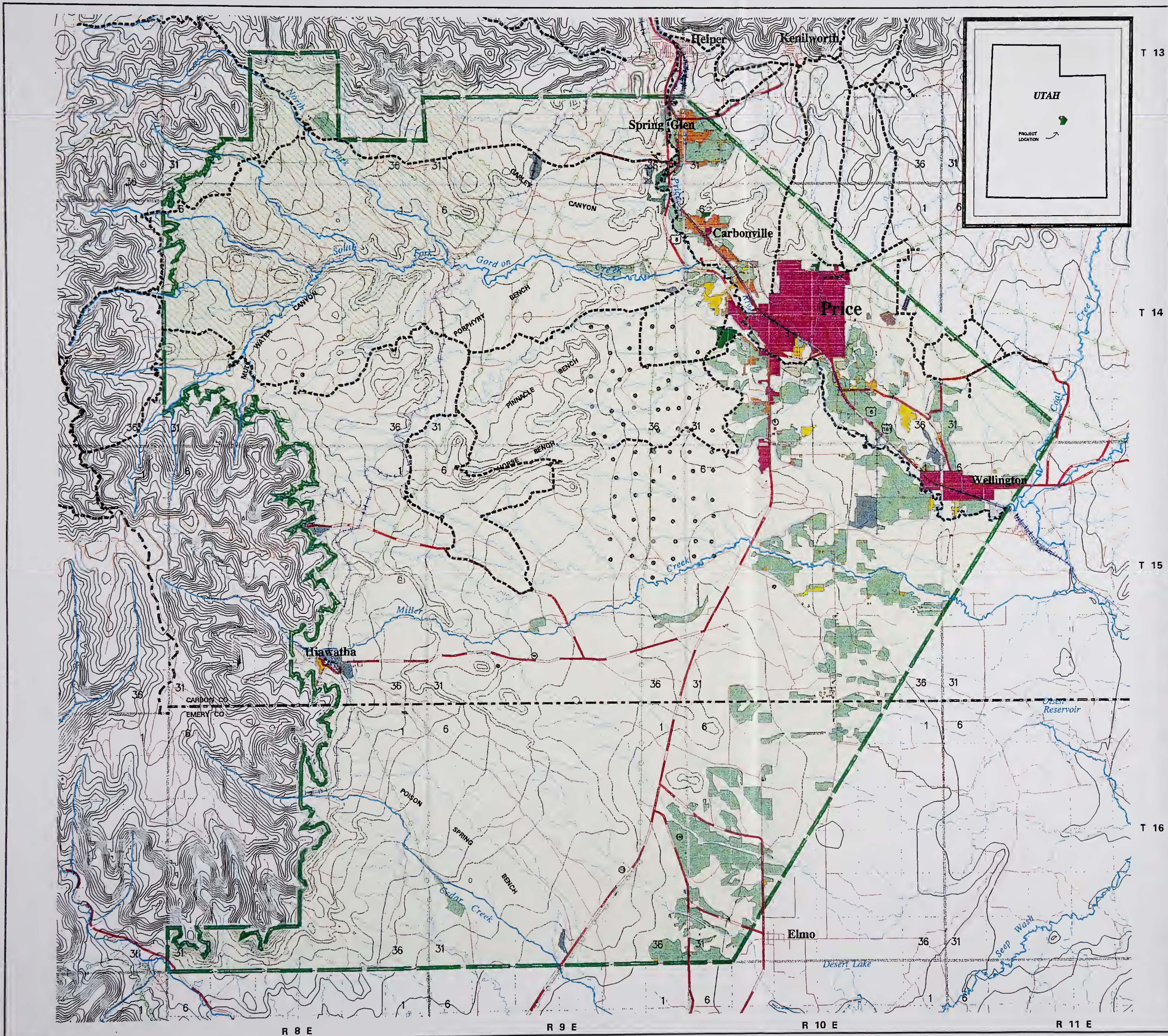
LEGEND

Contour Interval 40 Meters

- Proposed Price CBM EIS Boundary (RGC Project)
- Primary/Secondary Roads
- Other Roads; Trails
- Railroads
- Existing Pipelines/Transmission Lines
- Hydrology
- HIGH
- MEDIUM
- LOW
- Urban Areas

0 1 2 3 4
Miles

Source: Alpine Archaeological Consultants, Inc.



PRICE COALBED METHANE EIS

PLATE 22
EXISTING LAND USES

LEGEND

Contour Interval 40 Meters

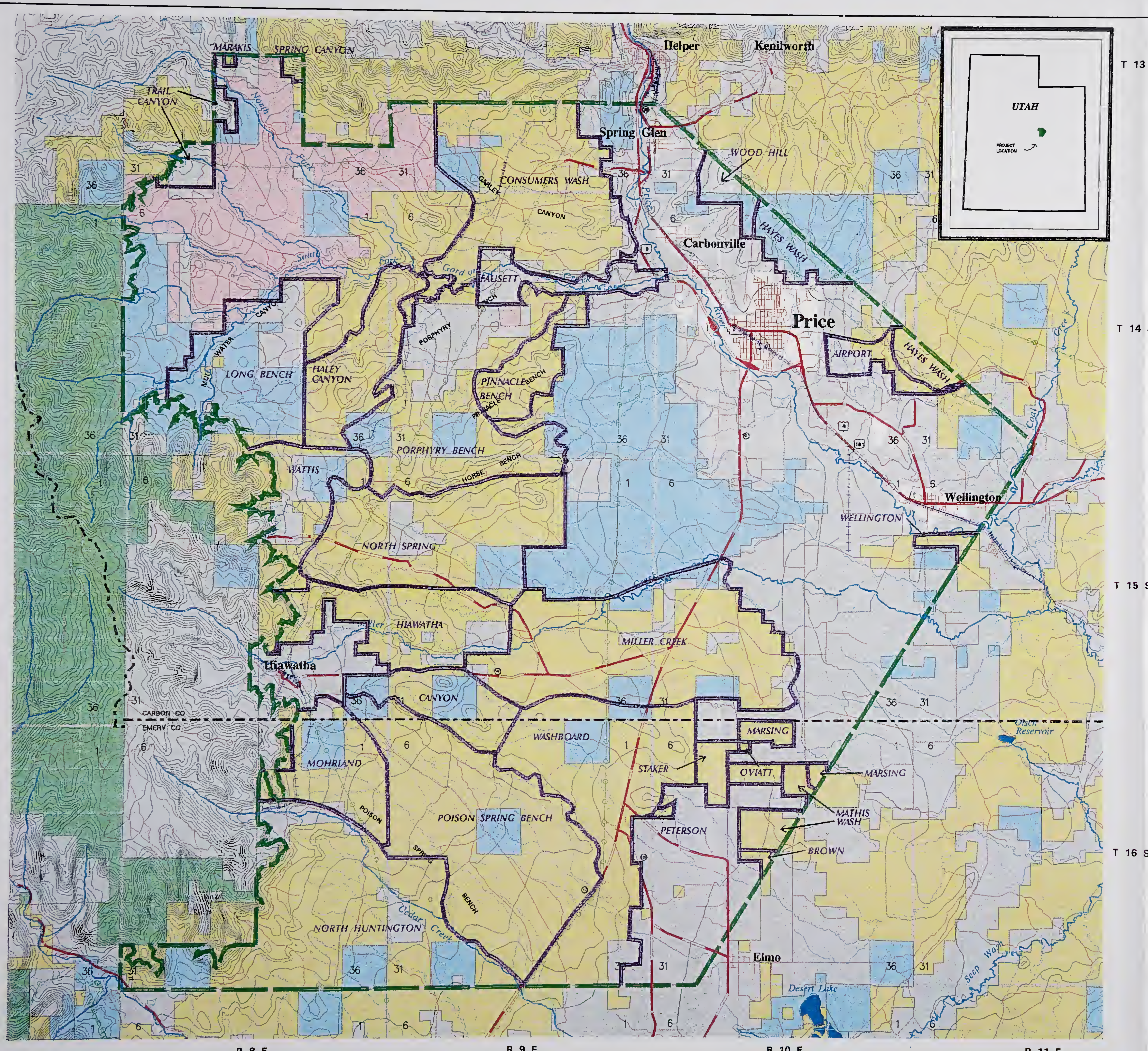
- Proposed Price CBM EIS Boundary (RGC Project)
- Primary/Secondary Roads
- Other Roads; Trails
- Railroads
- Existing Pipelines/Transmission Lines
- Hydrology
- Rural Residential (Rural/Dispursed)
- Single Family Residential
- Multi-Family Residential
- Mixed Residential (Primary use is Single Family Residential but other uses are intermixed such as agriculture, commercial or industrial)
- Trailer Park
- Commercial
- Industrial
- Commercial/Industrial
- Parks/Recreation
- Golf Course
- Public
- Airport
- Agriculture (includes irrigated crops, orchards, stockpens, corrals, pastures)
- Extractive Industry (includes oil & gas wells, quarries, borrow pits, mining)
- Sewage Treatment
- Landfill
- Urban
- Water Storage (Tanks, ponds)
- Open Space/Undeveloped
- Disturbed
- Gordon Creek State Wildlife Manangement Area
- Planned County Trail Corridors

0 1 2 3 4
Miles

Source: View Point West aerial photographs, Sept. 1994. Field checked 1995.

PRICE COALBED METHANE EIS

PLATE 23
BLM GRAZING ALLOTMENTS



LEGEND

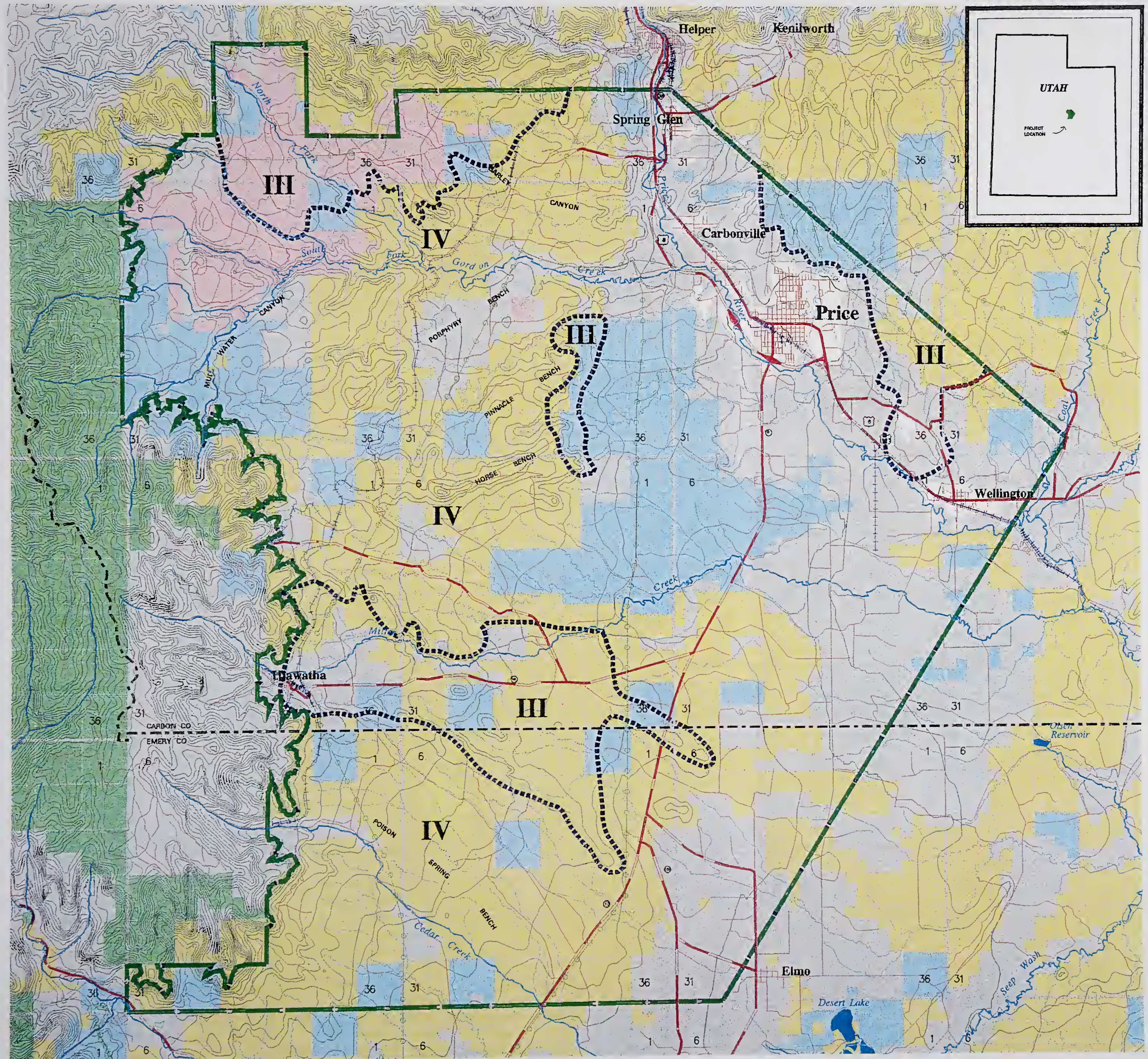
Contour Interval 40 Meters

- Proposed Price CBM EIS Boundary (RGC Project)
- Primary/Secondary Roads
- Other Roads; Trails
- Railroads
- Existing Pipelines/Transmission Lines
- Hydrology
- BLM
- State
- UDWR
- Forest Service
- Private
- Urban Areas
- Grazing Allotment Boundary

0 1 2 3 4
Miles

September 05, 1996

Source: BLM 1988 Rangeland Program Summary Update.



PRICE COALBED METHANE EIS

PLATE 24
VISUAL RESOURCE MGMT (VRM) CLASSES

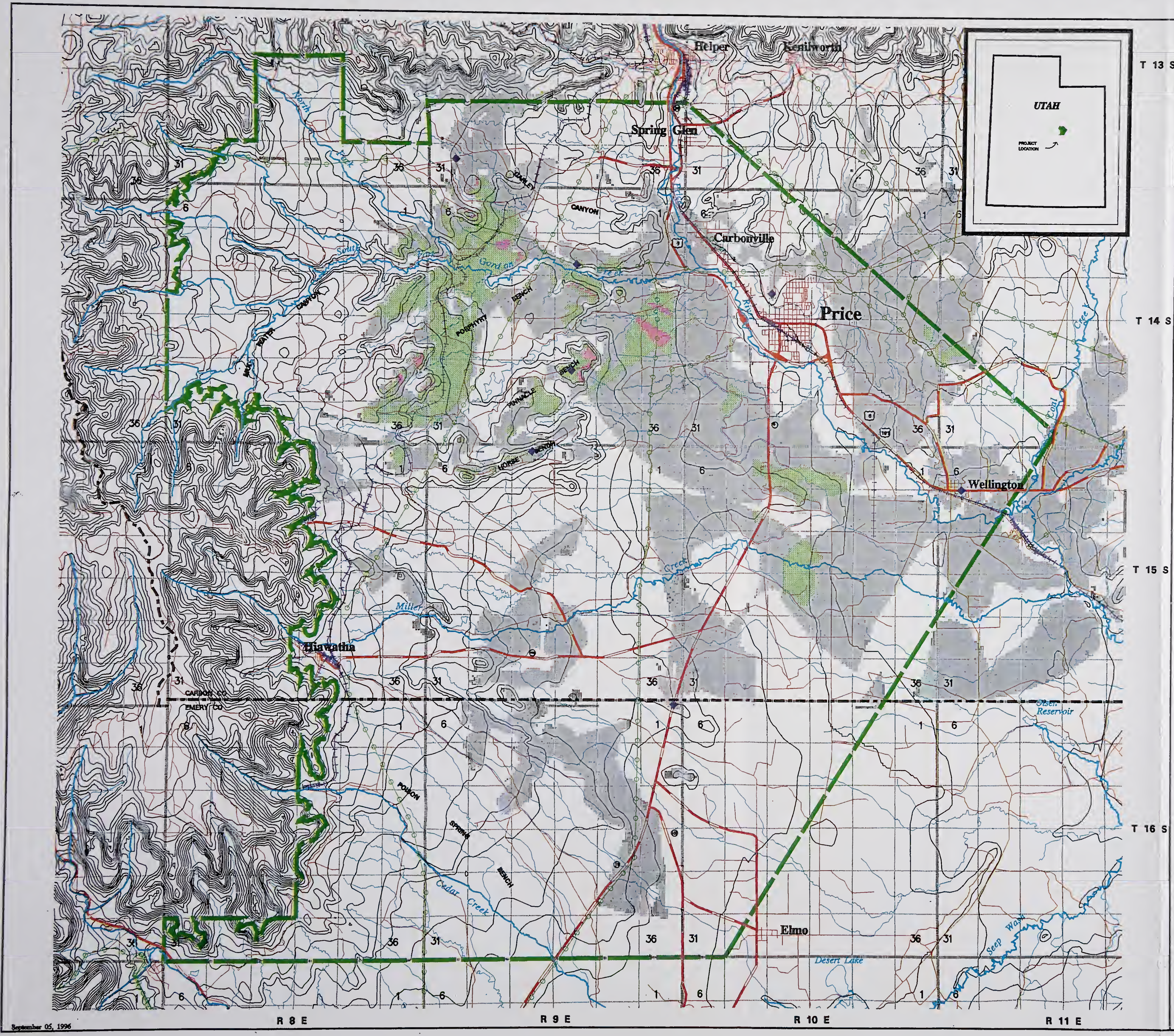
LEGEND

Contour Interval 40 Meters

- Proposed Price CBM EIS Boundary (RGC Project)
- Primary/Secondary Roads
- Other Roads; Trails
- Railroads
- Existing Pipelines/Transmission Lines
- Hydrology
- VRM Class Boundary
- BLM
- State
- UDWR
- Forest Service
- Private
- Urban Areas
- III VRM Class III
- IV VRM Class IV

0 1 2 3 4
Miles

Source: BLM Price River/San Rafael Resource Area



PRICE COALBED METHANE EIS

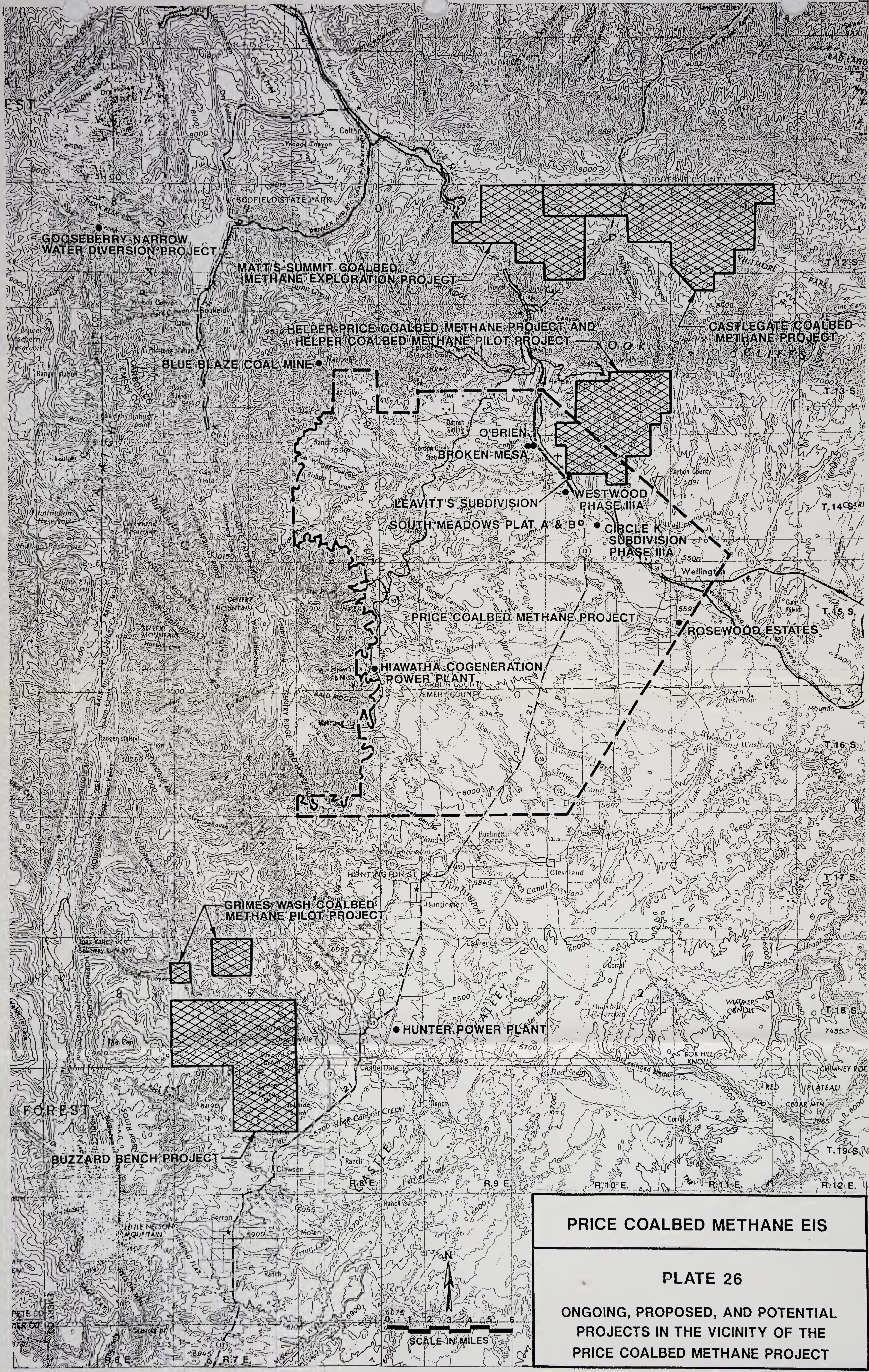
PLATE 25
ANTICIPATED VISIBILITY CONDITIONS

LEGEND

Contour Interval 40 Meters

- Proposed Price CBM EIS Boundary (RGC Project)
- Primary/Secondary Roads
- Other Roads; Trails
- Railroads
- Existing Pipelines/Transmission Lines
- Hydrology
- Seen By 1 KOP
- Seen By 2 KOP's
- Seen By 3 KOP's
- Key Obervation Point

0 1 2 3 4
Miles



PRICE COALBED METHANE EIS

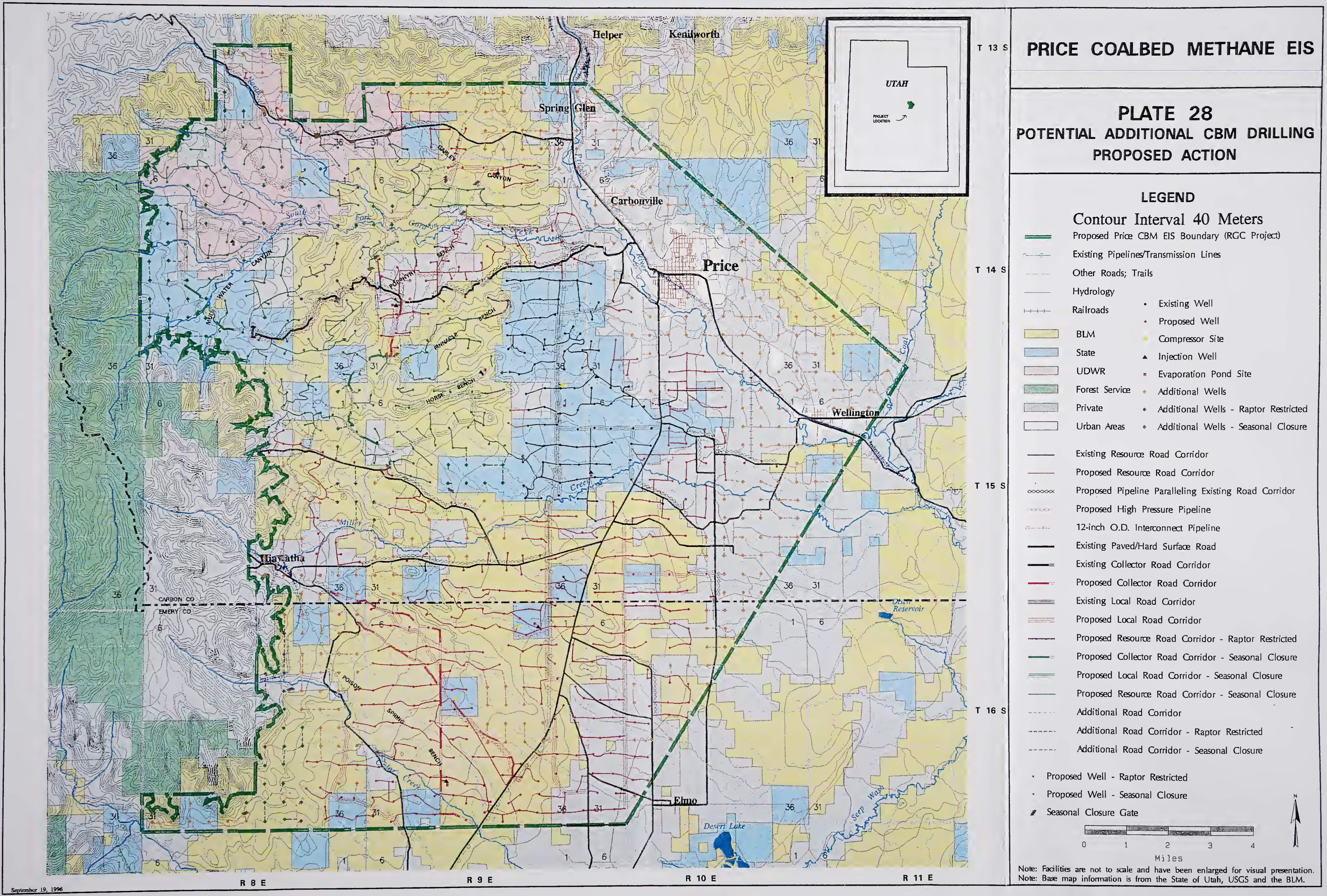
PLATE 26

ONGOING, PROPOSED, AND POTENTIAL PROJECTS IN THE VICINITY OF THE PRICE COALBED METHANE PROJECT

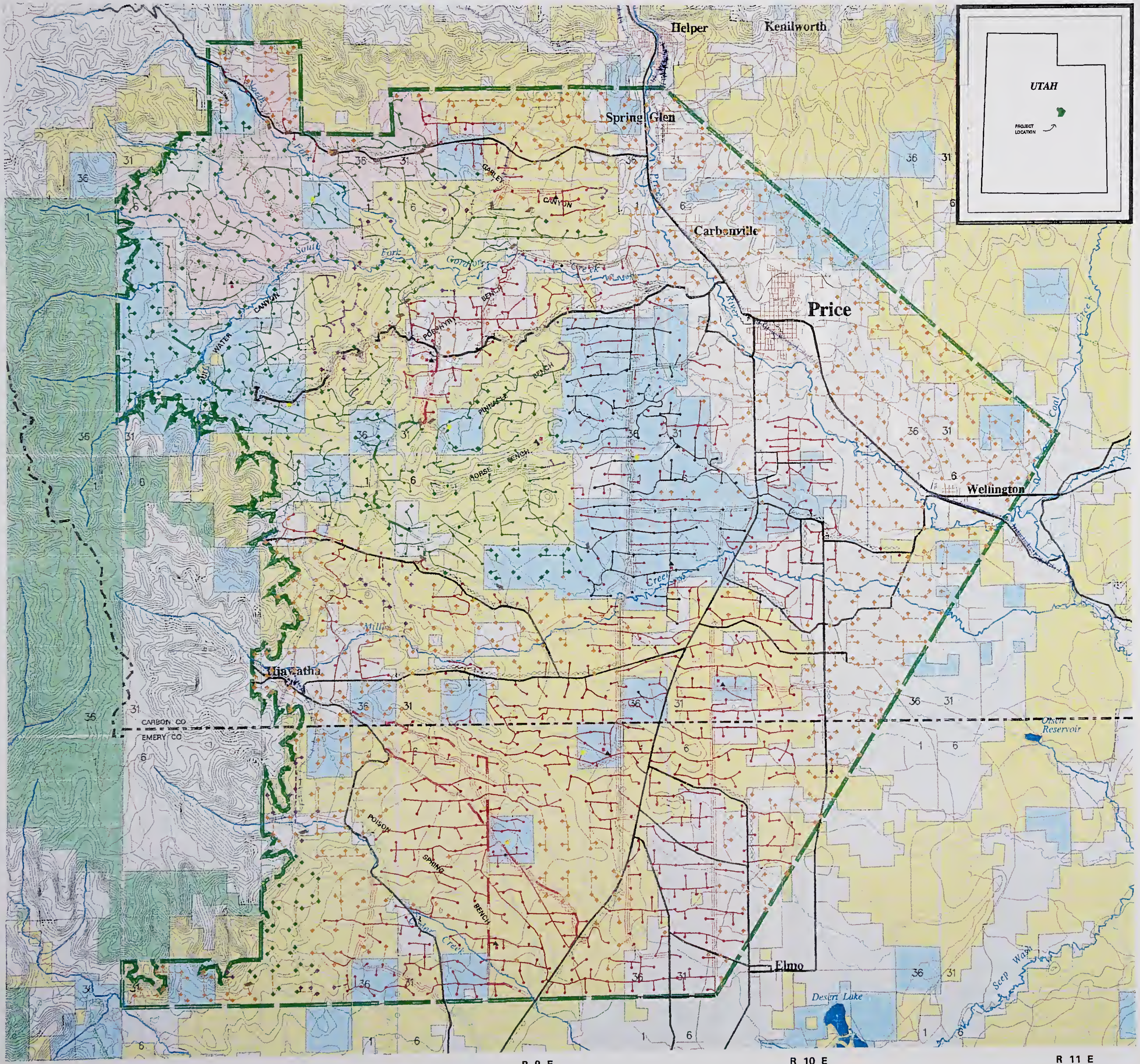
PRICE COALBED METHANE EIS

PLATE 27

LOCATION OF FERRON COALBED GAS FAIRWAY AND COAL MINES



PRICE COALBED METHANE EIS
PLATE 28
POTENTIAL ADDITIONAL CBM DRILLING
PROPOSED ACTION
LEGEND
Contour Interval 40 Meters
Proposed Price CBM EIS Boundary (RGC Project)
Existing Pipelines/Transmission Lines
Other Roads; Trails
Hydrology
Railroads
BLM
State
UDWR
Forest Service
Private
Urban Areas
Existing Well
Proposed Well
Compressor Site
Injection Well
Evaporation Pond Site
Additional Wells
Additional Wells - Raptor Restricted
Additional Wells - Seasonal Closure
Existing Resource Road Corridor
Proposed Resource Road Corridor
Proposed Pipeline Paralleling Existing Road Corridor
Proposed High Pressure Pipeline
12-inch O.D. Interconnect Pipeline
Existing Paved/Hard Surface Road
Existing Collector Road Corridor
Proposed Collector Road Corridor
Existing Local Road Corridor
Proposed Local Road Corridor
Proposed Resource Road Corridor - Raptor Restricted
Proposed Collector Road Corridor - Seasonal Closure
Proposed Local Road Corridor - Seasonal Closure
Proposed Resource Road Corridor - Seasonal Closure
Additional Road Corridor
Additional Road Corridor - Raptor Restricted
Additional Road Corridor - Seasonal Closure
Proposed Well - Raptor Restricted
Proposed Well - Seasonal Closure
Seasonal Closure Gate
0 1 2 3 4
Miles
Note: Facilities are not to scale and have been enlarged for visual presentation.
Note: Base map information is from the State of Utah, USGS and the BLM.
UTAH
Helper
Kenilworth
Spring Glen
Carbonville
Price
Wellington
Hiawatha
Elmo
Desert Lake
Olsen Reservoir
CARBON CO
EMERY CO
T 13 S
T 14 S
T 15 S
T 16 S
R 8 E
R 9 E
R 10 E
R 11 E
September 19, 1996



PRICE COALBED METHANE EIS

PLATE 29
POTENTIAL ADDITIONAL CBM DRILLING ALTERNATIVE A

LEGEND

Contour Interval 40 Meters

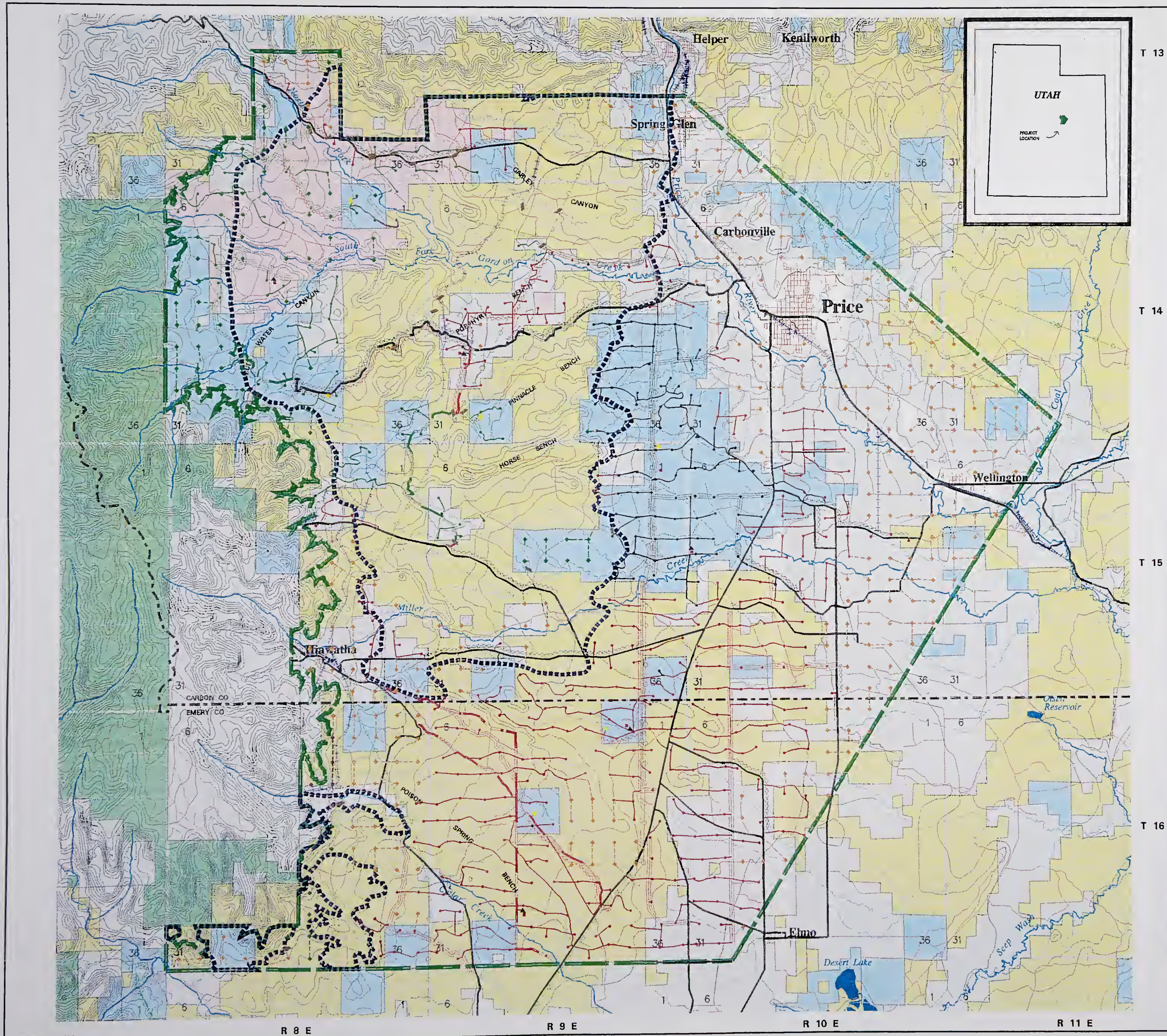
- Proposed Price CBM EIS Boundary (RGC Project)
- Existing Pipelines/Transmission Lines
- Other Roads; Trails
- Hydrology
- Railroads
- BLM
- State
- UDWR
- Forest Service
- Private
- Urban Areas
- Existing Well
- Proposed Well
- Compressor Site
- Injection Well
- Evaporation Pond Site
- Additional Wells
- Additional Wells - Raptor Restricted
- Additional Wells - Seasonal Closure
- Existing Resource Road Corridor
- Proposed Resource Road Corridor
- Proposed Pipeline Paralleling Existing Road Corridor
- Proposed High Pressure Pipeline
- 12-inch O.D. Interconnect Pipeline
- Existing Paved/Hard Surface Road
- Existing Collector Road Corridor
- Proposed Collector Road Corridor
- Existing Local Road Corridor
- Proposed Local Road Corridor
- Proposed Resource Road Corridor - Raptor Restricted
- Proposed Collector Road Corridor - Seasonal Closure
- Proposed Local Road Corridor - Seasonal Closure
- Proposed Resource Road Corridor - Seasonal Closure
- Additional Road Corridor
- Additional Road Corridor - Raptor Restricted
- Additional Road Corridor - Seasonal Closure
- Proposed Well - Raptor Restricted
- Proposed Well - Seasonal Closure
- Seasonal Closure Gate

0 1 2 3 4
Miles

N

Note: Facilities are not to scale and have been enlarged for visual presentation.
Note: Base map information is from the State of Utah, USGS and the BLM.

September 19, 1996



PRICE COALBED METHANE EIS

PLATE 30
POTENTIAL ADDITIONAL CBM DRILLING
ALTERNATIVE B1

LEGEND

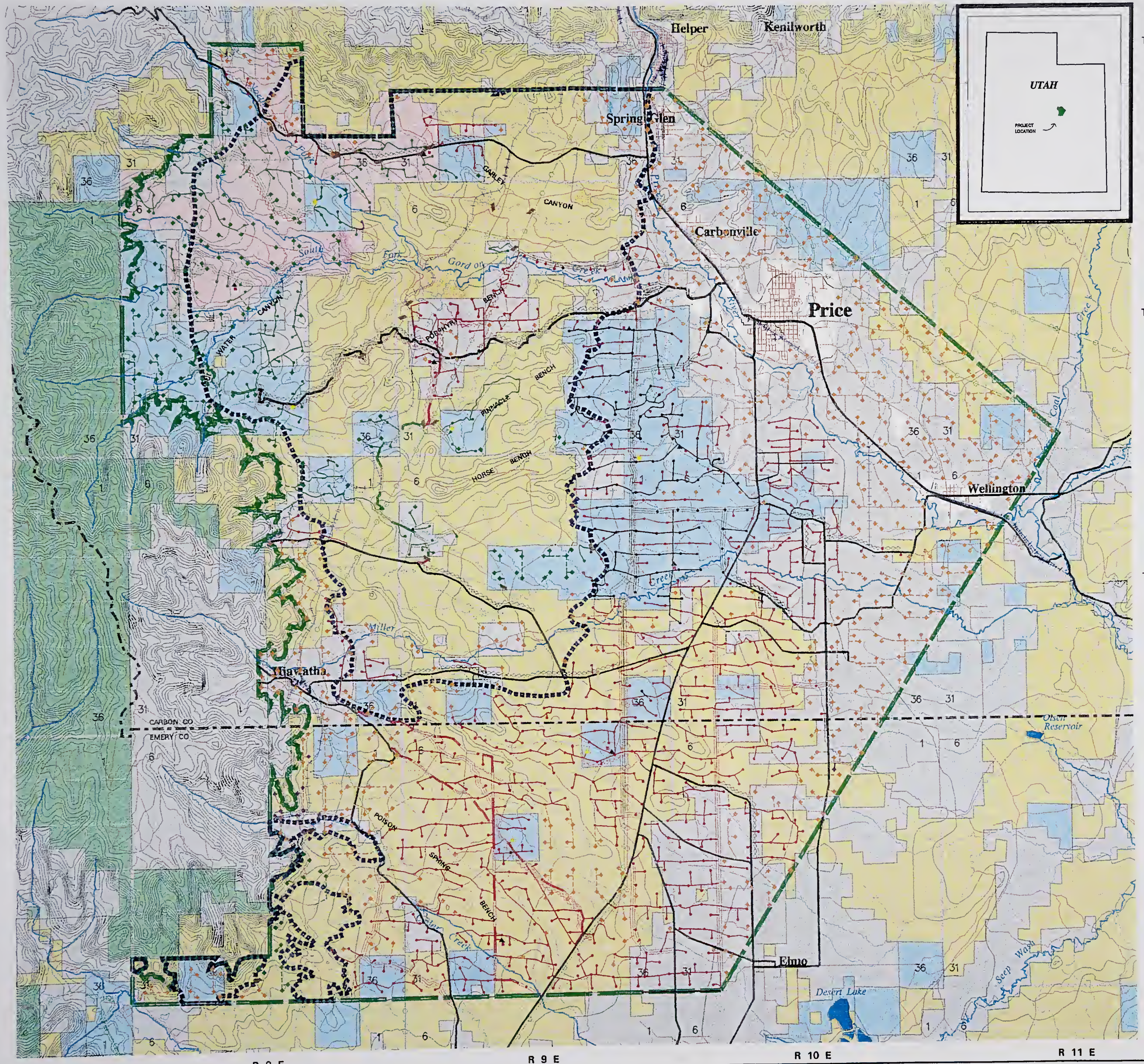
Contour Interval 40 Meters

- Proposed Price CBM EIS Boundary (RGC Project)
- Existing Pipelines/Transmission Lines
- Other Roads; Trails
- Hydrology
- Railroads
- BLM
- State
- UDWR
- Forest Service
- Private
- Urban Areas
- Existing Well
- Proposed Well
- Compressor Site
- Injection Well
- Evaporation Pond Site
- Additional Wells
- Additional Wells - Raptor Restricted
- Additional Wells - Seasonal Closure
- Existing Resource Road Corridor
- Proposed Resource Road Corridor
- Proposed Pipeline Paralleling Existing Road Corridor
- Proposed High Pressure Pipeline
- 12-inch O.D. Interconnect Pipeline
- Critical Wildlife Habitat
- Existing Paved/Hard Surface Road
- Existing Collector Road Corridor
- Proposed Collector Road Corridor
- Existing Local Road Corridor
- Proposed Local Road Corridor
- Proposed Resource Road Corridor - Raptor Restricted
- Proposed Collector Road Corridor - Seasonal Closure
- Proposed Local Road Corridor - Seasonal Closure
- Proposed Resource Road Corridor - Seasonal Closure
- Additional Road Corridor
- Additional Road Corridor - Raptor Restricted
- Additional Road Corridor - Seasonal Closure
- Proposed Well - Raptor Restricted
- Proposed Well - Seasonal Closure
- Seasonal Closure Gate

0 1 2 3 4
Miles

N

Note: Facilities are not to scale and have been enlarged for visual presentation.
Note: Base map information is from the State of Utah, USGS and the BLM.



PRICE COALBED METHANE EIS

PLATE 31
POTENTIAL ADDITIONAL CBM DRILLING
ALTERNATIVE B2

LEGEND

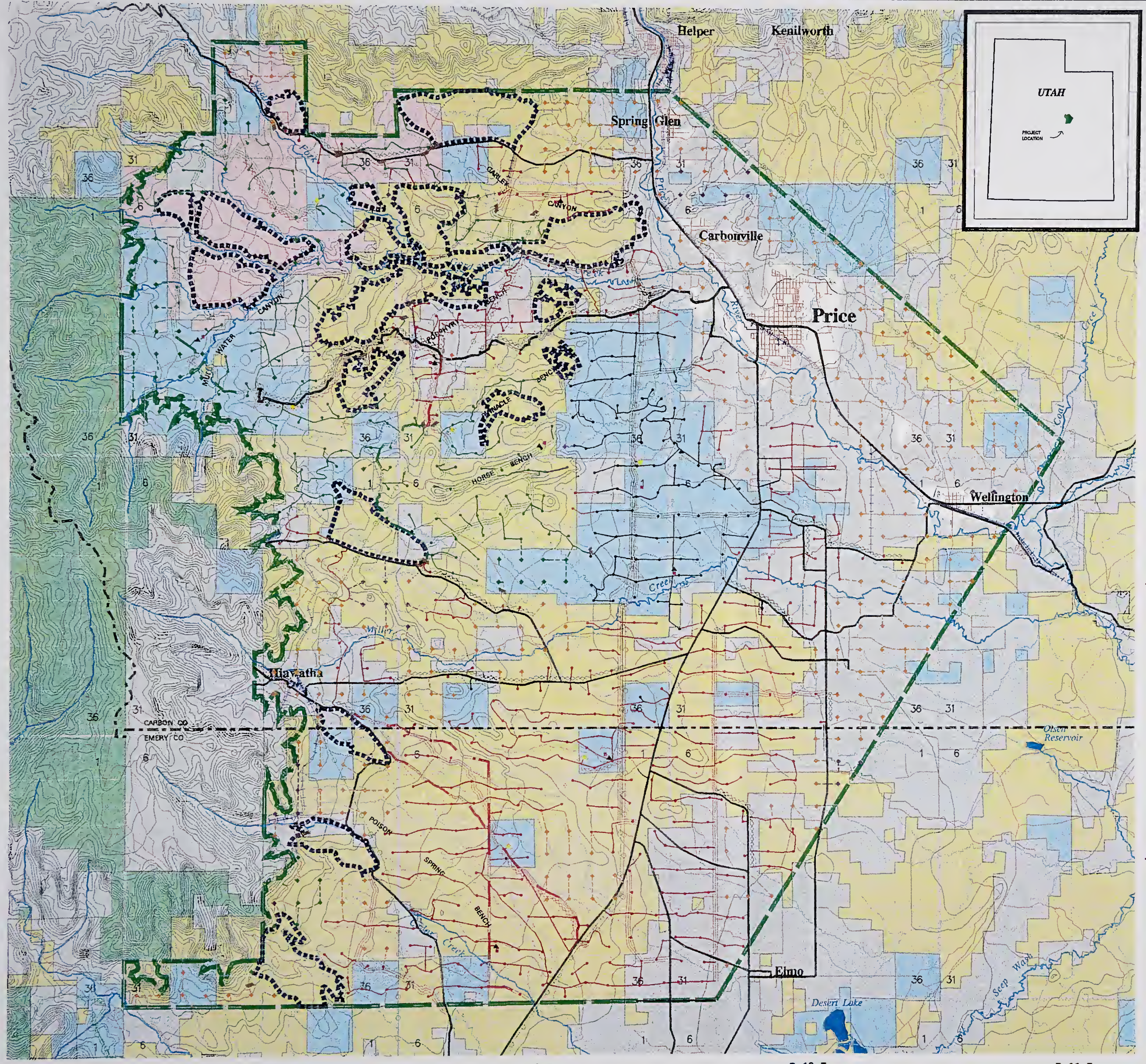
Contour Interval 40 Meters

- Proposed Price CBM EIS Boundary (RGC Project)
- Existing Pipelines/Transmission Lines
- Other Roads; Trails
- Hydrology
- Railroads
- BLM
- State
- UDWR
- Forest Service
- Private
- Urban Areas
- Existing Well
- Proposed Well
- Compressor Site
- Injection Well
- Evaporation Pond Site
- Additional Wells
- Additional Wells - Raptor Restricted
- Additional Wells - Seasonal Closure
- Existing Resource Road Corridor
- Proposed Resource Road Corridor
- Proposed Pipeline Paralleling Existing Road Corridor
- Proposed High Pressure Pipeline
- 12-inch O.D. Interconnect Pipeline
- Critical Wildlife Habitat
- Existing Paved/Hard Surface Road
- Existing Collector Road Corridor
- Proposed Collector Road Corridor
- Existing Local Road Corridor
- Proposed Local Road Corridor
- Proposed Resource Road Corridor - Raptor Restricted
- Proposed Collector Road Corridor - Seasonal Closure
- Proposed Local Road Corridor - Seasonal Closure
- Proposed Resource Road Corridor - Seasonal Closure
- Additional Road Corridor
- Additional Road Corridor - Raptor Restricted
- Additional Road Corridor - Seasonal Closure
- Proposed Well - Raptor Restricted
- Proposed Well - Seasonal Closure
- Seasonal Closure Gate

0 1 2 3 4
Miles

Note: Facilities are not to scale and have been enlarged for visual presentation.
Note: Base map information is from the State of Utah, USGS and the BLM.

September 19, 1996



September 19, 1996

PRICE COALBED METHANE EIS

PLATE 32

POTENTIAL ADDITIONAL CBM DRILLING ALTERNATIVE C1

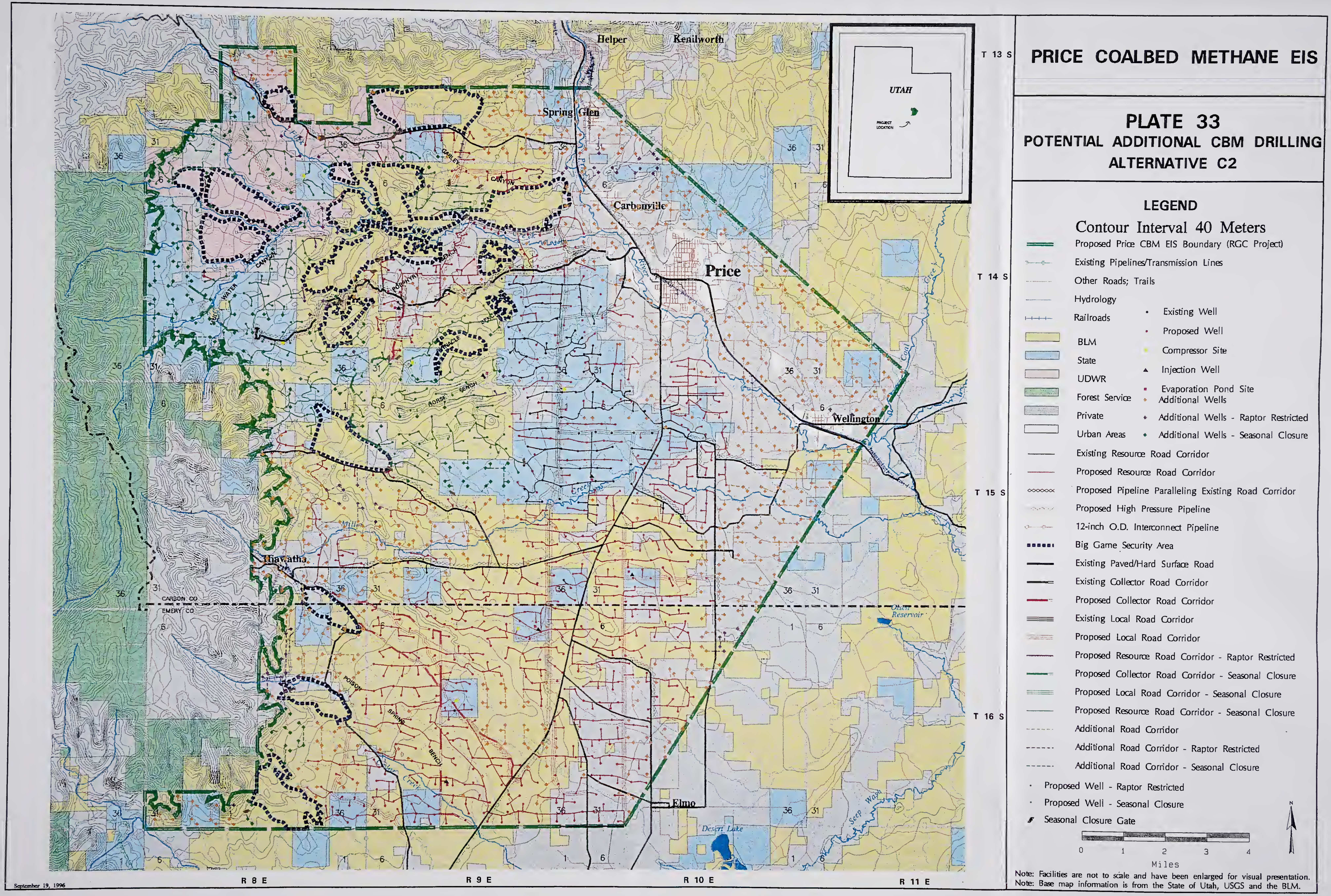
LEGEND

Contour Interval 40 Meters

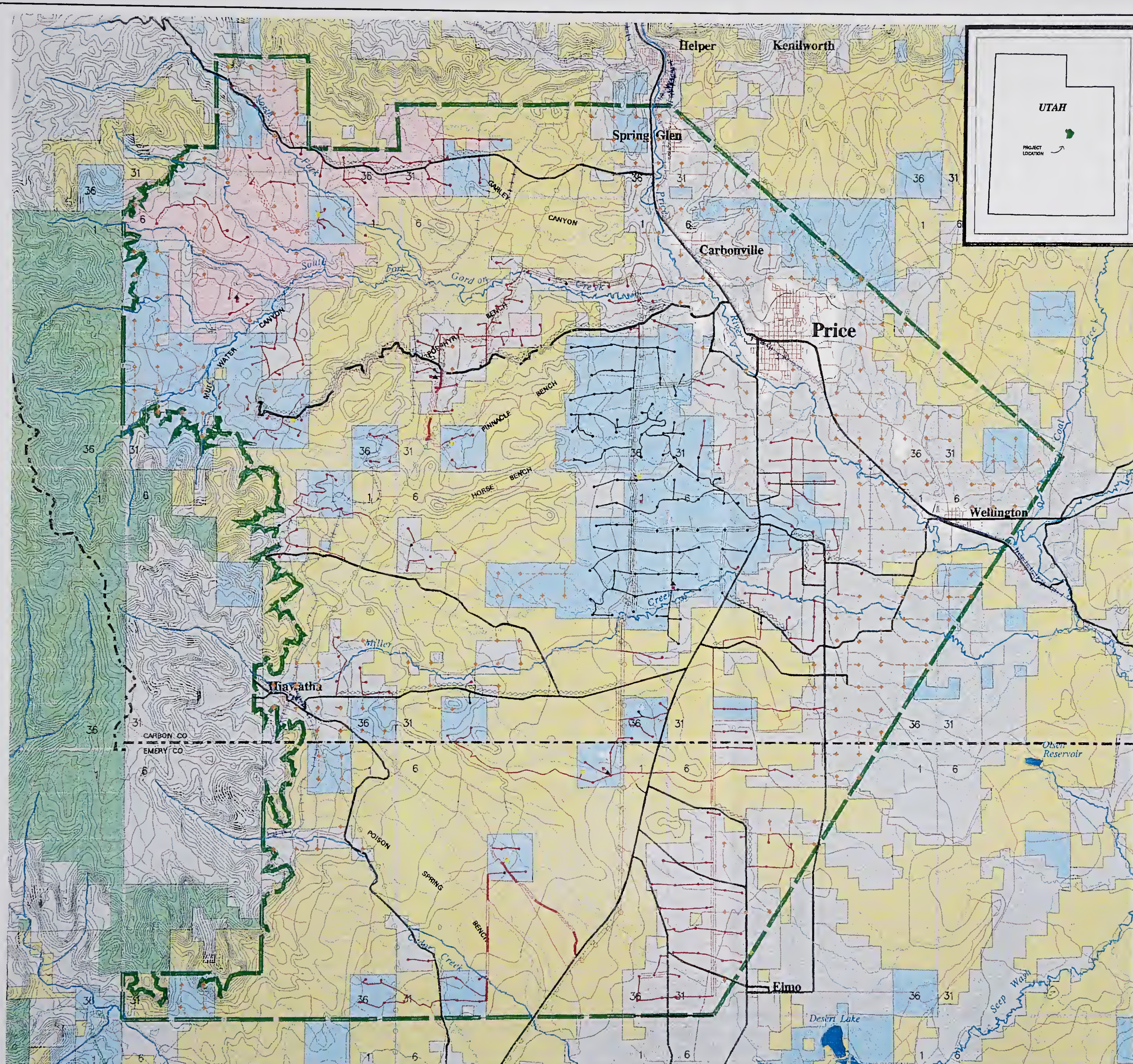
- Proposed Price CBM EIS Boundary (RGC Project)
- Existing Pipelines/Transmission Lines
- Other Roads; Trails
- Hydrology
- Railroads
- BLM
- State
- UDWR
- Forest Service
- Private
- Urban Areas
- Existing Well
- Proposed Well
- Compressor Site
- Injection Well
- Evaporation Pond Site
- Additional Wells
- Additional Wells - Raptor Restricted
- Additional Wells - Seasonal Closure
- Existing Resource Road Corridor
- Proposed Resource Road Corridor
- Proposed Pipeline Paralleling Existing Road Corridor
- Proposed High Pressure Pipeline
- 12-inch O.D. Interconnect Pipeline
- Big Game Security Area
- Existing Paved/Hard Surface Road
- Existing Collector Road Corridor
- Proposed Collector Road Corridor
- Existing Local Road Corridor
- Proposed Local Road Corridor
- Proposed Resource Road Corridor - Raptor Restricted
- Proposed Collector Road Corridor - Seasonal Closure
- Proposed Local Road Corridor - Seasonal Closure
- Proposed Resource Road Corridor - Seasonal Closure
- Additional Road Corridor
- Additional Road Corridor - Raptor Restricted
- Additional Road Corridor - Seasonal Closure
- Proposed Well - Raptor Restricted
- Proposed Well - Seasonal Closure
- Seasonal Closure Gate

0 1 2 3 4
Miles

Note: Facilities are not to scale and have been enlarged for visual presentation.
Note: Base map information is from the State of Utah, USGS and the BLM.



PRICE COALBED METHANE EIS
PLATE 33
POTENTIAL ADDITIONAL CBM DRILLING
ALTERNATIVE C2
LEGEND
Contour Interval 40 Meters
Proposed Price CBM EIS Boundary (RGC Project)
Existing Pipelines/Transmission Lines
Other Roads; Trails
Hydrology
Railroads
BLM
State
UDWR
Forest Service
Private
Urban Areas
Existing Well
Proposed Well
Compressor Site
Injection Well
Evaporation Pond Site
Additional Wells
Additional Wells - Raptor Restricted
Additional Wells - Seasonal Closure
Existing Resource Road Corridor
Proposed Resource Road Corridor
Proposed Pipeline Paralleling Existing Road Corridor
Proposed High Pressure Pipeline
12-inch O.D. Interconnect Pipeline
Big Game Security Area
Existing Paved/Hard Surface Road
Existing Collector Road Corridor
Proposed Collector Road Corridor
Existing Local Road Corridor
Proposed Local Road Corridor
Proposed Resource Road Corridor - Raptor Restricted
Proposed Collector Road Corridor - Seasonal Closure
Proposed Local Road Corridor - Seasonal Closure
Proposed Resource Road Corridor - Seasonal Closure
Additional Road Corridor
Additional Road Corridor - Raptor Restricted
Additional Road Corridor - Seasonal Closure
Proposed Well - Raptor Restricted
Proposed Well - Seasonal Closure
Seasonal Closure Gate
0 1 2 3 4
Miles
N
Note: Facilities are not to scale and have been enlarged for visual presentation.
Note: Base map information is from the State of Utah, USGS and the BLM.
UTAH
PROJECT LOCATION
Helper
Kenilworth
Spring Glen
Carbonville
Price
Wellington
Hiawatha
Elmo
Olsen Reservoir
Desert Lake
CARBON CO
EMERY CO
T 13 S
T 14 S
T 15 S
T 16 S
R 8 E
R 9 E
R 10 E
R 11 E
September 19, 1996



PRICE COALBED METHANE EIS

PLATE 34
POTENTIAL ADDITIONAL CBM DRILLING
NO ACTION

LEGEND

Contour Interval 40 Meters

- Proposed Price CBM EIS Boundary (RGC Project)
- Existing Pipelines/Transmission Lines
- Other Roads; Trails
- Hydrology
- Railroads
- BLM
- State
- UDWR
- Forest Service
- Private
- Urban Areas
- Existing Well
- Proposed Well
- Compressor Site
- Injection Well
- Evaporation Pond Site
- Additional Wells
- Existing Resource Road Corridor
- Proposed Resource Road Corridor
- Proposed Pipeline Paralleling Existing Road Corridor
- Proposed High Pressure Pipeline
- 12-inch O.D. Interconnect Pipeline
- Existing Paved/Hard Surface Road
- Existing Collector Road Corridor
- Proposed Collector Road Corridor
- Existing Local Road Corridor
- Proposed Local Road Corridor
- Additional Road

0 1 2 3 4
Miles

Note: Facilities are not to scale and have been enlarged for visual presentation.
Note: Base map information is from the State of Utah, USGS and the BLM.

September 19, 1996

① Monitoring movement of injected fluid

② more accurately describe the fate of the injected fluid

③ Need a ~~new~~ map showing the new potentiometric surface after injection. ~~will the~~ new surface will be the seam of the old surface and the local increased head.

④ ~~Hydrogeologic discontinuities~~ Facies changes that act as barriers to flow

⑤ Faults as barriers to flow or channels to allow escape of fluid from the injection horizon.

⑥ effects of displaced formation water.

⑦ Limit injection to below fracture pressure

⑧ ~~Need~~ Need quantification of fluid pressure at which fracturing will take place

⑨ Need a geologic/hydrologic rept. assessing the area for suitability for wastewater injection

⑩ Regional hydrodynamics
- Flow directions, gradient in injection zone
- regional GW studies
- structure maps

⑪ Need map showing springs and wells in project area. Are list of springs shown in ~~table~~ Appendix 3A

⑫ map showing extent of drawdown.

⑬ Discussion of time that drawdown will take to return to pre project conditions

⑭ pg. 4-6 this discussion of known areas of potable water is unacceptable.

APPENDIX 1A
OIL AND GAS CATEGORY SYSTEM

APPENDIX 1A
OIL AND GAS CATEGORY SYSTEM

The oil and gas category system was placed into effect in 1976 through a process that included the preparation of programmatic District Oil and Gas EARs (now EAs) and the categorization of lands in planning documents. The category system was established for the purpose of providing an efficient, responsive oil and gas leasing system while giving consideration to other resource values that require protection. The system has proved to be of immeasurable value during the present Bureau-wide effort to eliminate backlogged lease applications. Utah has by far the least number of pending applications awaiting processing of any of the "oil and gas states" because of the efficiencies derived from the system.

The Combined Hydrocarbon Leasing Act of 1981 (PL 97-78) changed the definition of oil to read: "the term oil shall embrace all non-gaseous hydrocarbon substances other than those substances leasable as coal, oil shale or gilsonite (including all vein-type solid hydrocarbons)," consequently the use of the word oil now includes the tar sands resource. Under this definition tar sands can be developed under a regular oil and gas lease outside of Special Tar Sands Areas on those leases issued after November 16, 1981. Tar sands will therefore be included in the oil and gas categories. Within Special Tar Sands Areas, combined hydrocarbon leases are to be issued on a competitive basis. The term "oil and gas" as used in this guidance includes tar sands except when specifically referred to as "conventional oil and gas."

The following is a general description of the four oil and gas categories and the resource protection and lease stipulations applicable in each of the categories. Also provided is a general discussion of the relationship of the oil and gas categories to wilderness study areas (WSAs).

Category 1 - Open Lease Areas

This category includes lands that possess the resource values which would not be in serious conflict with oil and gas exploration and development. These lands are leased subject to standard stipulations which provide for the protection of the resource values and environmental components commonly associated with the public lands and require the lessee to take certain measures to mitigate possible impacts that might be created by oil and gas exploration and development. These stipulations do not impose major restrictions as to the lessee activities but provide for operations under controlled conditions.

Attached to all oil and gas leases issued under category 1 are the "Surface Disturbance Stipulations" as contained on BLM Form No. 3109-5 (enclosure 2). These stipulations are often referred to as the "open end" stipulations. The provisions of the "open end" stipulations are applied at the time that exploration or development operations are planned on the lease. The stipulations are administered through MMS/BLM coordination and the surface use and operating plan submitted in accordance with NTL-6 with the application for permit to drill. These stipulations provide a broad basis for

including additional requirements at the time of surface disturbance to assure proper protection of the land surface, other resources and the environment. However, such subsequent conditions are to be reasonable and not inconsistent with the purpose of the issued lease, which is to provide for the exploration and production of oil and gas.

Category 2 - Open Lease Areas Subject to Special Stipulations

Some areas contain resource values where serious conflict with oil and gas exploration and development might occur; therefore, leasing in this category is subject to special stipulations that provide additional protection to the watersheds, specific crucial wildlife habitat areas, unique archaeological and historical sites, etc. The special stipulations may limit exploration to various times of the year, prescribe special construction techniques, limit the location of developments, or require other similar special resource protections.

In addition to the surface disturbance stipulation, special stipulations are utilized in category 2. The special stipulations are applied to site-specific situations and are more restrictive than the surface disturbance stipulations. The special stipulations are utilized where there are significant resource values that require special protection, but where the conflicts with oil and gas exploration and development would not be of sufficient magnitude to preclude surface occupancy. These special stipulations were developed and have been in use since 1975, they are standardized for use Bureau wide and have been agreed upon by MMS as to language. A minor revision in language was completed in 1980 to permit utilization by the Forest Service. The list of special stipulations are contained in enclosure 3.

Because the list of special stipulations also contains stipulations utilized in category 3 and because other stipulations are not applicable to Utah's category system, the following limitations are placed on their use.

1. Special stipulations numbers 1 and 2 require concurrence on a case by case basis. Overall coordination to secure a blanket MMS approval will be done as a part of category review process by the Utah State Office.

2. Special stipulation number 1 is the category 3 No Surface Occupancy Stipulation. It will not be used in category 2.

3. Special stipulation number 2 has not been widely used in Utah's category system. The items covered have been considered as something more appropriately handled at the time of the application for permit to drill.

4. Special stipulation number 4 is a No Surface Occupancy Stipulation to be used only for areas of irregular shape and size that cannot be described by legal subdivision. This is to be considered as a category 2 stipulation because allowances are made for adjustment in the field.

5. Special stipulation number 10 has not been used on leases under the category system. It has been viewed as a requirement that can be covered under the Surface Disturbance Stipulations at the time of lease development.

6. Special stipulations 11 through 14 will not be used except by the Forest Service.

The special stipulation list is not intended to be all inclusive. Additional stipulations may be proposed for use to cover unique situations that the special stipulations do not cover. However, such stipulations will not be approved for use if they are redundant or the standardized special stipulation can be used. It is again anticipated that over 90% of the situations encountered can be covered by the special stipulations contained in enclosure 3. Use of any stipulations other than those included on the list must receive specific clearance from the State Director and MMS.

Category 3 - Open Lease Areas Subject to No Surface Occupancy

These areas have special resource values or land uses with which oil and gas operations would not be compatible. These areas could include camping and picnic areas, research areas, scenic areas, R&PP patents and leases, significant historical and archaeological areas, buffer zones along the boundaries of special areas such as wild and scenic river corridors, etc. Exploratory drilling is permitted but is limited to whipstocking or slant drilling from off-site locations. Use of this category is therefore limited to that feasible for drilling in this fashion. A maximum of one mile is considered feasible if approachable from two or more sides. (One half mile if the area can be approached, from only one side).

Special stipulation numbers 1 and 3 are utilized in this category.

Category 4 - No Lease Areas

These are areas where oil and gas leasing is undesirable pending further planning or special studies and includes areas that are too large in size to permit slant drilling or include values that cannot be adequately protected by the other lease categories. Examples include some areas of potential wild and scenic river corridors, and larger high quality scenic areas where roads, pipelines, drilling activities, etc. are not compatible with management for these uses. As further information is obtained, and public needs are better understood, these areas many continue to be closed to leasing or made available.

No lease is issued; therefore, no stipulations required.

APPENDIX 1B
BLM LEASE CATEGORIES/STIPULATIONS FROM BLM PLATS (LEASE) BOOK FOR THE PRICE RIVER RESOURCE AREA

Category 3, No Surface Occupancy/Activity and Category 4, No Lease

1. Helper City Cemetery. Occupancy or other activity on the surface of T. 13 S. R. 10 E., SLB&M, Section 19: W½NW¼NW¼NE¼ is not allowed under this lease.

2. Carbon County Airport. Category 3 Stipulation: Occupancy or other activity on the surface (legal description) is not allowed under this lease.

3. Carbon County Recreation Complex. Occupancy or other activity on the surface of (legal subdivision) is not allowed under this lease.

4. Carbon County Sanitary Landfill. Occupancy or other activity on the surface of (legal subdivision) is not allowed under this lease.

5. Incorporated Cities. No lease.

7. Emery County School Complex. Occupancy or other activity on the surface of (legal subdivision) is not allowed.

31. Isolated Raptor Nests. Occupancy or other activity on the surface of (legal subdivision) is not allowed under this lease.

Category 2, Timing Limitations on Controlled Surface Use

16. High Country Watershed.

    1) In order to minimize watershed damage, exploration, drilling, and other development activity will be allowed only during the period from April 30 to November 1. This limitation does not apply to maintenance and operation of producing wells. Exceptions to this limitation in any year may be specifically authorized in writing by the Authorized Officer of the Bureau of Land Management.

2) Occupancy or other surface disturbance will not be allowed within 330 feet of the centerline or within the 100-year recurrence interval floodplain, whichever is greater, of the perennial streams. This distance may be modified when specifically approved in writing by the Authorized Officer of the Bureau of Land Management.

3) Construction of access roads and drill pads on slopes in excess of 30 percent will require special design standards to minimize watershed damage. Drilling operations and any associated construction activities on slopes in excess of 50 percent may require directional drilling to prevent damage to the watershed. Exceptions to the limitations may be specifically authorized in writing by the Authorized Officer of the Bureau of Land Management.

4) Occupancy or other surface disturbance will not be allowed within 660 feet of springs, whether flowing or not. This distance may be modified when specifically approved in writing by the Authorized Officer of the Bureau of Land Management.

18. Floodplains of Perennial Streams Below Book Cliffs and Wasatch Plateau. Occupancy or other surface disturbance will not be allowed within 330 feet of the centerline or within the 100-year recurrence interval floodplain of the perennial stream (insert name). This distance may be modified when specifically approved in writing by the Authorized Officer of the Bureau of Land Management.

19. Springs. Occupancy or other surface disturbance will not be allowed within 660 feet of springs, whether flowing or not. This distance may be modified when specifically approved in writing by the Authorized Officer of the Bureau of Land Management.

21. Elk Critical Winter Range. In order to protect elk critical winter range, exploration, drilling and other development activity will be allowed only during the period May 16 through October 31. This limitation does not apply to maintenance and operation of producing wells. Exceptions to this limitation in any year may be specifically authorized in writing by the Authorized Officer of the Bureau of Land Management.

22. <u>Moose Critical Winter Range</u>. In order to protect critical habitat area for wintering moose, exploration, drilling and other development activity will be allowed from May 16 to October 31 only. This limitation does not apply to maintenance and operation of producing wells. Exceptions to this limitation in any year may be specifically authorized by the Authorized Officer of the Bureau of Land Management.

23. <u>Icelander Antelope Fawning Area</u>. In order to protect antelope fawning, exploration, drilling and other development activity will be allowed only from July 21 to May 14. This limitation does not apply to maintenance and operation of producing wells. Exceptions to this limitation in any year may be specifically authorized in writing by the Authorized Officer of the Bureau of Land Management.

25. <u>Mule Deer Critical Winter Habitat</u>. In order to protect critical deer winter range, exploration, drilling and other development activity will be allowed only from May 16 to October 31. This limitation does not apply to maintenance and operation of producing wells. Exceptions to this limitation in any year may be specifically authorized in writing by the Authorized Officer of the Bureau of Land Management.

26. <u>Mule Deer Critical Winter Habitat</u>. In order to protect critical deer winter range, exploration, drilling and other development activity will be allowed only from May 16 to October 31. This limitation does not apply to maintenance and operation of producing wells. Exceptions to this limitation in any year may be specifically authorized in writing by the Authorized Officer of the Bureau of Land Management.

28. <u>Gordon Creek Mule Deer Critical/Elk High Priority Winter Range</u>. In order to protect critical deer winter range/elk high priority range, exploration, drilling and other development activity will be allowed only during the period May 16 to October 31. This limitation does not apply to maintenance and operation of producing wells. Exceptions to this limitation in any year may be specifically authorized in writing by the Authorized Officer of the Bureau of Land Management.

30. High Density Raptor Nesting Complex. Raptor surveys will be required whenever surface disturbances and/or occupancy proposed in association with oil/gas exploration occur within a known nesting complex for raptors. Field surveys will be conducted by the lessee/operator as determined by the Authorized Officer of the Bureau of Land Management. When surveys are required of the lessee/operator, the consultant hired must be found acceptable to the Authorized Officer prior to the field survey being conducted. Based on the results of the field survey, the Authorized Officer will determine appropriate buffer zones.

32. Sage Grouse Strutting/Nesting Area. In order to protect nesting sage grouse, exploration, drilling and other development activity will be allowed only from June 16 to March 31. This limitation does not apply to maintenance and operation of producing wells. Exceptions to this limitation in any year may be specifically authorized in writing by the Authorized Officer of the Bureau of Land Management.

The following Standard Lease Terms would apply to all other leased federal lands in the Project Area:

Standard Lease Terms

The Standard Lease Terms are contained in Form 3100-11, Offer to Lease and Lease for Oil and Gas, United States Department of the Interior, BLM, June 1988 (see Appendix B). The Standard Lease Terms provide the lessee the right to use the leased land as needed to explore for, drill for, extract, remove and dispose of oil and gas deposits located under the leased lands. Operations must be conducted in a manner that minimizes adverse impacts to the land, air, water, cultural, biological, and visual elements of the environment, and well as other land uses or users. Federal environmental protection laws such as the Clean Water Act, Endangered Species Act, and Historic Preservation Act, will be applied to all lands and are included in the standard lease stipulations. If threatened or endangered species, objects of historic, cultural, or scientific value, or substantial unanticipated environmental effects are encountered during construction, all work affecting the resource will stop and the land management agency will be contacted. Surface-disturbing operations that would destroy or harm these species or objects are prohibited.

Standard Lease Terms provide for reasonable measures to minimize adverse impacts to surface resources. These include, but are not limited to, modifications to the siting or design of facilities, timing of operations, and specifications of interim and final reclamation measures. Standard Lease Terms may not require the lessee to relocate drilling rigs or supporting facilities by more than 200 meters, require that operations be sited off the leasehold, or prohibit new surface-disturbing operations for more than 60 days each year (43 CFR Part 3101.1-2).

The lease requires that the lessee meet stipulation conditions or avoid activities within all, or an identified part, of the leasehold. All leases are subject to regulations and formal orders of the Secretary of the Interior in effect at the time of issuance.

APPENDIX 2A
BREAKDOWN OF SOURCES AND EXTENT OF PROPOSED DISTURBANCE BY ALTERNATIVE

TABLE 2A-1
PROPOSED ACTION - 160 ACRE WELL SPACING
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

FEDERAL LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	347		484	484
Transportation Corridor- Collector Roads		16	169	96
Transportation Corridor- Local Roads		27	250	133
Transportation Corridor- Resource Roads		147	1178	546
Gathering Pipelines/Utilities		15	65	0
Interconnect Pipeline		6	29	0
Compressor Sites	0		0	0
Injection Wells	3		24	24
Evaporation Ponds	3		12	12
Total			2211	1295
Raptor Restricted[1]				
Production Wells	17		24	24
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		0	0	0
Transportation Corridor- Resource Roads		4	65	65
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			89	89
Winter Closure[1]				
Production Wells	105		147	147
Transportation Corridor- Collector Roads		3	33	19
Transportation Corridor- Local Roads		9	81	43
Transportation Corridor- Resource Roads		44	356	172
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			617	381

TABLE 2A-1
PROPOSED ACTION - 160 ACRE WELL SPACING
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

UDWR LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	46		65	65
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		8	73	39
Transportation Corridor- Resource Roads		20	162	78
Gathering Pipelines/Utilities		5	22	0
Interconnect Pipeline		0	0	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Total			334	194
Winter Closure[1]				
Production Wells	40		56	56
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		8	71	38
Transportation Corridor- Resource Roads		18	143	69
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			270	163

UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	69		98	98
Transportation Corridor- Collector Roads		8	72	43
Transportation Corridor- Local Roads		5	47	25
Transportation Corridor- Resource Roads		36	293	141
Gathering Pipelines/Utilities		4	16	0
Interconnect Pipeline		9	41	0
Compressor Sites	5		25	25
Injection Wells	2		16	16
Evaporation Ponds	2		8	8
Total			616	356
Winter Closure[1]				
Production Wells	28		40	40
Transportation Corridor- Collector Roads		4	38	22
Transportation Corridor- Local Roads		1	12	6
Transportation Corridor- Resource Roads		15	118	57
Compressor Sites	3		15	15
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			223	140

TABLE 2A-1
PROPOSED ACTION - 160 ACRE WELL SPACING
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

PRIVATE LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	139		195	195
Transportation Corridor- Collector Roads		2	21	12
Transportation Corridor- Local Roads		11	100	53
Transportation Corridor- Resource Roads		69	551	236
Gathering Pipelines/Utilities		12	49	0
Interconnect Pipeline		1	6	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Total			934	508
Winter Closure[1]				
Production Wells	16		22	22
Transportation Corridor- Collector Roads		1	11	6
Transportation Corridor- Local Roads		2	17	9
Transportation Corridor- Resource Roads		11	84	41
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			134	78

TABLE 2A-1
PROPOSED ACTION - 160 ACRE WELL SPACING
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

TOTAL LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	601		842	842
Transportation Corridor- Collector Roads		26	262	151
Transportation Corridor- Local Roads		52	470	250
Transportation Corridor- Resource Roads		272	2184	1001
Gathering Pipelines/Utilities		35	152	0
Interconnect Pipeline		16	76	0
Compressor Sites	5		25	25
Injection Wells	7		56	56
Evaporation Ponds	7		28	28
Total			4095	2353
Raptor Restricted[1]				
Production Wells	17		24	24
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		0	0	0
Transportation Corridor- Resource Roads		4	65	65
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			89	89
Winter Closure[1]				
Production Wells	189		265	265
Transportation Corridor- Collector Roads		8	82	47
Transportation Corridor- Local Roads		20	181	97
Transportation Corridor- Resource Roads		87	701	338
Compressor Sites	3		15	15
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			1244	762

[1] Disturbance in Raptor Restricted and Winter Closure areas is a subset of total disturbance shown for each land ownership category; thus, Raptor Restricted and Winter Closure categories do not represent additional disturbance.

TABLE 2A-2
ALTERNATIVE A - 80 ACRE WELL SPACING - SOURCES AND EXTENT OF PROPOSED DISTURBANCE

FEDERAL LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Long-Term
Production Wells	604		844	844
Transportation Corridor- Collector Roads		16	169	96
Transportation Corridor- Local Roads		27	250	133
Transportation Corridor- Resource Roads		207	1655	802
Gathering Pipelines/Utilities		15	65	0
Interconnect Pipeline		6	29	0
Compressor Sites	0		0	0
Injection Wells	4		32	32
Evaporation Ponds	4		16	16
Total			3060	1923
Raptor Restricted[1]				
Production Wells	26		36	36
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		0	0	0
Transportation Corridor- Resource Roads		6	50	24
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			86	60
Winter Closure[1]				
Production Wells	176		246	246
Transportation Corridor- Collector Roads		3	33	19
Transportation Corridor- Local Roads		9	81	43
Transportation Corridor- Resource Roads		62	518	250
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			878	558

TABLE 2A-2
ALTERNATIVE A - 80 ACRE WELL SPACING -
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

UDWR LANDS

			Acres Disturbed	
Facility	No.	Miles	Short-Term	Long-Term
Production Wells	66		93	93
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		8	73	39
Transportation Corridor- Resource Roads		24	193	93
Gathering Pipelines/Utilities		5	22	0
Interconnect Pipeline		0	0	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Total			393	237
Winter Closure[1]				
Production Wells	59		83	83
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		8	71	38
Transportation Corridor- Resource Roads		21	173	83
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			327	204

UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS

			Acres Disturbed	
Facility	No.	Miles	Short-Term	Long-Term
Production Wells	187		263	263
Transportation Corridor- Collector Roads		8	72	43
Transportation Corridor- Local Roads		5	47	25
Transportation Corridor- Resource Roads		107	532	257
Gathering Pipelines/Utilities		4	16	0
Interconnect Pipeline		9	41	0
Compressor Sites	5		25	25
Injection Wells	2		16	16
Evaporation Ponds	2		8	8
Total			1020	637
Winter Closure[1]				
Production Wells	46		65	65
Collector Roads		4	38	22
Local Roads		1	12	6
Resource Roads		18	148	71
Compressor Sites	3		15	15
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			278	179

TABLE 2A-2
ALTERNATIVE A - 80 ACRE WELL SPACING - SOURCES AND EXTENT OF PROPOSED DISTURBANCE

PRIVATE LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	246		345	345
Transportation Corridor- Collector Roads		2	21	12
Transportation Corridor- Local Roads		11	100	53
Transportation Corridor- Resource Roads		99	752	366
Gathering Pipelines/Utilities		12	49	0
Interconnect Pipeline		1	6	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Total			1285	788
Winter Closure[1]				
Production Wells	27		37	37
Collector Roads		1	11	6
Local Roads		2	17	9
Resouree Roads		13	103	50
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			168	102

TABLE 2A-2
ALTERNATIVE A - 80 ACRE WELL SPACING -
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

TOTAL LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	1103		1545	1545
Transportation Corridor- Collector Roads		26	262	151
Transportation Corridor- Local Roads		51	470	250
Transportation Corridor- Resource Roads		437	3132	1518
Gathering Pipelines/Utilities		36	152	0
Interconnect Pipeline		16	76	0
Compressor Sites	5		25	25
Injection Wells	8		64	64
Evaporation Ponds	8		32	32
Total			5758	3585
Raptor Restricted[1]				
Production Wells	26		36	36
Collector Roads		0	0	0
Local Roads		0	0	0
Resource Roads		6	50	24
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			86	60
Winter Closure[1]				
Production Wells	308		431	431
Collector Roads		8	82	47
Local Roads		20	181	96
Resource Roads		114	942	454
Compressor Sites	3		15	15
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			1651	1043

[1] Disturbance in Raptor Restricted and Winter Closure areas is a subset of total disturbance shown for each land ownership category; thus, Raptor Restricted and Winter Closure categories do not represent additional disturbance.

TABLE 2A-3
ALTERNATIVE B1
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

FEDERAL LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	195		273	273
Transportation Corridor- Collector Roads		16	169	96
Transportation Corridor- Local Roads		16	149	79
Transportation Corridor- Resource Roads		88	704	343
Gathering Pipelines/Utilities		15	65	0
Interconnect Pipeline		6	29	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Total			1401	803
Raptor Restricted[1]				
Production Wells	1		1	1
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		0	0	0
Transportation Corridor- Resource Roads		<0.5	3	2
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			4	3
Winter Closure[1]				
Production Wells	1		2	2
Transportation Corridor- Collector Roads		3	33	19
Transportation Corridor- Local Roads		<0.5	4	2
Transportation Corridor- Resource Roads		1	11	5
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			50	28

TABLE 2A-3
ALTERNATIVE B1
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

UDWR LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	34		48	48
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		8	73	39
Transportation Corridor- Resource Roads		13	107	51
Gathering Pipelines/Utilities		5	22	0
Interconnect Pipeline		0	0	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Total			262	150
Winter Closure[1]				
Production Wells	28		39	39
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		8	71	38
Transportation Corridor- Resource Roads		11	92	44
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			202	121

UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	69		97	97
Transportation Corridor- Collector Roads		8	72	43
Transportation Corridor- Local Roads		5	45	24
Transportation Corridor- Resource Roads		33	269	130
Gathering Pipelines/Utilities		4	16	0
Interconnect Pipeline		9	41	0
Compressor Sites	5		25	25
Injection Wells	2		16	16
Evaporation Ponds	2		8	8
Total			589	343
Winter Closure[1]				
Production Wells	28		39	39
Transportation Corridor- Collector Roads		4	38	22
Transportation Corridor- Local Roads		1	9	5
Transportation Corridor- Resource Roads		12	96	46
Compressor Sites	3		15	15
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			197	127

TABLE 2A-3
ALTERNATIVE B1
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

PRIVATE LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	138		193	193
Transportation Corridor- Collector Roads		2	21	12
Transportation Corridor- Local Roads		7	99	53
Transportation Corridor- Resource Roads		64	519	252
Gathering Pipelines/Utilities		12	49	0
Interconnect Pipeline		1	6	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Total			899	522
Winter Closure[1]				
Production Wells	18		24	24
Transportation Corridor- Collector Roads		1	11	6
Transportation Corridor- Local Roads		2	17	9
Transportation Corridor- Resource Roads		8	66	32
Gathering Pipelines/Utilities		1	4	4
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			122	75

TABLE 2A-3
ALTERNATIVE B1
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

TOTAL LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	436		611	611
Transportation Corridor- Collector Roads		26	262	151
Transportation Corridor- Local Roads		36	366	195
Transportation Corridor- Resource Roads		198	1599	776
Gathering Pipelines/Utilities		36	152	0
Interconnect Pipeline		16	76	0
Compressor Sites	5		25	25
Injection Wells	5		40	40
Evaporation Ponds	5		20	20
Total			3151	1818
Raptor Restricted[1]				
Production Wells	1		1	1
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		0	0	0
Transportation Corridor- Resource Roads		<0.5	3	2
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			4	3
Winter Closure[1]				
Production Wells	75		104	104
Transportation Corridor- Collector Roads		8	82	47
Transportation Corridor- Local Roads		11	101	16
Transportation Corridor- Resource Roads		32	265	83
Compressor Sites	3		15	15
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			567	265

[1] Disturbance in Raptor Restricted and Winter Closure areas is a subset of total disturbance shown for each land ownership category; thus, Raptor Restricted and Winter Closure categories do not represent additional disturbance.

TABLE 2A-4
ALTERNATIVE B2
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

FEDERAL LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	351		492	492
Transportation Corridor- Collector Roads		16	169	96
Transportation Corridor- Local Roads		16	148	79
Transportation Corridor- Resource Roads		127	1018	495
Gathering Pipelines/Utilities		15	65	0
Interconnect Pipeline		6	29	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Total			1933	1174
Raptor Restricted[1]				
Production Wells	1		1	1
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		0	0	0
Transportation Corridor- Resource Roads		<0.5	3	1
Compressor Sites	0		0	0
Injection-Wells	0		0	0
Evaporation Ponds	0		0	0
Total			4	2
Winter Closure[1]				
Production Wells	1		2	2
Transportation Corridor- Collector Roads		3	33	19
Transportation Corridor- Local Roads		<0.5	4	2
Transportation Corridor- Resource Roads		4	35	17
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			74	40

TABLE 2A-4
ALTERNATIVE B2
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

UDWR LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	51		72	72
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		8	73	39
Transportation Corridor- Resource Roads		17	139	67
Gathering Pipelines/Utilities		5	22	0
Interconnect Pipeline		0	0	0
Compressor Sites	0		0	0
Injection Wells	2		16	16
Evaporation Ponds	2		8	8
Total			330	202
Winter Closure[1]				
Production Wells	44		62	62
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		8	71	38
Transportation Corridor- Resource Roads		15	122	59
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Total			267	171

UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	186		261	261
Transportation Corridor- Collector Roads		8	72	43
Transportation Corridor- Local Roads		5	45	24
Transportation Corridor- Resource Roads		63	512	247
Gathering Pipelines/Utilities		4	16	0
Interconnect Pipeline		9	41	0
Compressor Sites	5		25	25
Injection Wells	3		24	24
Evaporation Ponds	3		12	12
Total			1008	636
Winter Closure[1]				
Production Wells	45		63	63
Transportation Corridor- Collector Roads		4	38	22
Transportation Corridor- Local Roads		1	9	5
Transportation Corridor- Resource Roads		17	134	64
Compressor Sites	3		15	15
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			259	169

TABLE 2A-4
ALTERNATIVE B2
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

PRIVATE LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Long-Term
Production Wells	243		340	340
Transportation Corridor- Collector Roads		2	21	12
Transportation Corridor- Local Roads		7	99	53
Transportation Corridor- Resource Roads		88	712	346
Gathering Pipelines/Utilities		12	49	0
Interconnect Pipeline		1	6	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Total			1239	763
Winter Closure[1]				
Production Wells	28		38	38
Transportation Corridor- Collector Roads		1	11	6
Transportation Corridor- Local Roads		2	17	9
Transportation Corridor- Resource Roads		11	89	43
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			155	96

TABLE 2A-4
ALTERNATIVE B2
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

TOTAL LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	831		1165	1165
Transportation Corridor- Collector Roads		26	262	151
Transportation Corridor- Local Roads		36	365	195
Transportation Corridor- Resource Roads		295	2381	1155
Gathering Pipelines/Utilities		36	152	0
Interconnect Pipeline		16	76	0
Compressor Sites	5		25	25
Injection Wells	7		56	56
Evaporation Ponds	7		28	28
Total			4510	2775
Raptor Restricted[1]				
Production Wells	1		1	1
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		0	0	0
Transportation Corridor- Resource Roads		<0.5	3	1
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			4	2
Winter Closure[1]				
Production Wells	118		165	165
Transportation Corridor- Collector Roads		8	82	47
Transportation Corridor- Local Roads		11	101	16
Transportation Corridor- Resource Roads		47	380	124
Compressor Sites	3		15	15
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Total			755	379

[1] Disturbance in Raptor Restricted and Winter Closure areas is a subset of total disturbance shown for each land ownership category; thus, Raptor Restricted and Winter Closure categories do not represent additional disturbance.

TABLE 2A-5
ALTERNATIVE C1
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

FEDERAL LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	311		434	434
Transportation Corridor- Collector Roads		16	169	96
Transportation Corridor- Local Roads		27	242	129
Transportation Corridor- Resource Roads		126	1043	487
Gathering Pipelines/Utilities		15	65	0
Interconnect Pipeline		6	29	0
Compressor Sites	0		0	0
Injection Wells	3		24	24
Evaporation Ponds	3		12	12
Total			2018	1182
Raptor Restricted[1]				
Production Wells	9		13	13
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		0	0	0
Transportation Corridor- Resource Roads		2	15	7
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			28	20
Winter Closure[1]				
Production Wells	77		108	108
Transportation Corridor- Collector Roads		3	33	19
Transportation Corridor- Local Roads		8	73	39
Transportation Corridor- Resource Roads		27	237	115
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			451	281

TABLE 2A-5
ALTERNATIVE C1
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

UDWR LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	34		48	48
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		0	54	29
Transportation Corridor- Resource Roads		12	106	51
Gathering Pipelines/Utilities		5	22	0
Interconnect Pipeline		0	0	0
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			230	128
Winter Closure[1]				
Production Wells	28		39	39
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		6	52	28
Transportation Corridor- Resource Roads		12	94	45
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			185	112

UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	66		94	94
Transportation Corridor- Collector Roads		8	72	43
Transportation Corridor- Local Roads		5	47	25
Transportation Corridor- Resource Roads		35	286	137
Gathering Pipelines/Utilities		4	16	0
Interconnect Pipeline		9	41	0
Compressor Sites	5		25	25
Injection Wells	3		24	24
Evaporation Ponds	3		12	12
Total			617	360
Winter Closure[1]				
Production Wells	28		40	40
Transportation Corridor- Collector Roads		4	38	22
Transportation Corridor- Local Roads		1	12	6
Transportation Corridor- Resource Roads		14	118	57
Compressor Sites	3		15	15
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			223	140

TABLE 2A-5
ALTERNATIVE C1
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

PRIVATE LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Long-Term
Production Wells	139		194	194
Transportation Corridor- Collector Roads		2	21	12
Transportation Corridor- Local Roads		11	97	52
Transportation Corridor- Resource Roads		66	534	230
Gathering Pipelines/Utilities		12	49	0
Interconnect Pipeline		1	6	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Total			913	500
Winter Closure[1]				
Production Wells	15		20	20
Transportation Corridor- Collector Roads		1	11	6
Transportation Corridor- Local Roads		2	15	8
Transportation Corridor- Resource Roads		9	71	34
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			117	68

TABLE 2A-5
ALTERNATIVE C1
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

TOTAL LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	550		770	770
Transportation Corridor- Collector Roads		26	262	151
Transportation Corridor- Local Roads		43	440	235
Transportation Corridor- Resource Roads		239	1969	905
Gathering Pipelines/Utilities		36	152	0
Interconnect Pipeline		16	76	0
Compressor Sites	5		25	25
Injection Wells	7		56	56
Evaporation Ponds	7		28	28
Total			3778	2170
Raptor Restricted[1]				
Production Wells	9		13	13
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		0	0	0
Transportation Corridor- Resource Roads		2	15	7
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			28	20
Winter Closure[1]				
Production Wells	148		207	207
Transportation Corridor- Collector Roads		8	82	47
Transportation Corridor- Local Roads		17	152	53
Transportation Corridor- Resource Roads		62	520	206
Compressor Sites	3		15	15
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			976	528

[1] Disturbance in Raptor Restricted and Winter Closure areas is a subset of total disturbance shown for each land ownership category; thus, Raptor Restricted and Winter Closure categories do not represent additional disturbance.

TABLE 2A-6
ALTERNATIVE C2
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

FEDERAL LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	543		759	759
Transportation Corridor- Collector Roads		16	169	96
Transportation Corridor- Local Roads		27	242	129
Transportation Corridor- Resource Roads		183	1475	715
Gathering Pipelines/Utilities		15	65	0
Interconnect Pipeline		6	29	0
Compressor Sites	0		0	0
Injection Wells	4		32	32
Evaporation Ponds	4		16	16
Total			2787	1747
Raptor Restricted[1]				
Production Wells	11		15	15
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		0	0	0
Transportation Corridor- Resource Roads		2	20	9
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			35	24
Winter Closure[1]				
Production Wells	128		179	179
Transportation Corridor- Collector Roads		3	33	19
Transportation Corridor- Local Roads		8	73	39
Transportation Corridor- Resource Roads		40	362	175
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			647	412

TABLE 2A-6
ALTERNATIVE C2
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

UDWR LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	48		67	67
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		6	54	29
Transportation Corridor- Resource Roads		15	131	63
Gathering Pipelines/Utilities		5	22	0
Interconnect Pipeline		0	0	0
Compressor Sites	0		0	0
Injection Wells	0		2	2
Evaporation Ponds	1		4	4
Total			280	165
Winter Closure[1]				
Production Wells	43		60	60
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		6	52	28
Transportation Corridor- Resource Roads		14	115	55
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			227	143

UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	182		256	256
Transportation Corridor- Collector Roads		8	72	43
Transportation Corridor- Local Roads		5	47	25
Transportation Corridor- Resource Roads		105	522	252
Gathering Pipelines/Utilities		4	16	0
Interconnect Pipeline		9	41	0
Compressor Sites	5		25	25
Injection Wells	2		16	16
Evaporation Ponds	2		8	8
Total			1003	625
Winter Closure[1]				
Production Wells	45		64	64
Transportation Corridor- Collector Roads		4	38	22
Transportation Corridor- Local Roads		1	12	6
Transportation Corridor- Resource Roads		18	146	70
Compressor Sites	3		15	15
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			275	177

TABLE 2A-6
ALTERNATIVE C2
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

PRIVATE LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	240		336	336
Transportation Corridor- Collector Roads		2	21	12
Transportation Corridor- Local Roads		11	97	52
Transportation Corridor- Resource Roads		95	721	351
Gathering Pipelines/Utilities		12	49	0
Interconnect Pipeline		1	6	0
Compressor Sites	0		0	0
Injection Wells	2		14	14
Evaporation Ponds	1		4	4
Total			1248	769
Winter Closure[1]				
Production Wells	23		32	32
Transportation Corridor- Collector Roads		1	11	6
Transportation Corridor- Local Roads		2	15	8
Transportation Corridor- Resource Roads		1	83	40
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			141	86

TABLE 2A-6
ALTERNATIVE C2
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

TOTAL LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	1013		1418	1418
Transportation Corridor- Collector Roads		26	262	151
Transportation Corridor- Local Roads		49	440	235
Transportation Corridor- Resource Roads		398	2849	1381
Gathering Pipelines/Utilities		36	152	0
Interconnect Pipeline		16	76	0
Compressor Sites	5		25	25
Injection Wells	8		64	64
Evaporation Ponds	8		32	32
Total			5318	3306
Raptor Restricted[1]				
Production Wells	11		15	15
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		0	0	0
Transportation Corridor- Resource Roads		2	20	9
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			35	24
Winter Closure[1]				
Production Wells	239		335	335
Transportation Corridor- Collector Roads		8	82	47
Transportation Corridor- Local Roads		17	152	53
Transportation Corridor- Resource Roads		73	706	285
Compressor Sites	3		15	15
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			1290	735

[1] Disturbance in Raptor Restricted and Winter Closure areas is a subset of total disturbance shown for each land ownership category; thus, Raptor Restricted and Winter Closure categories do not represent additional disturbance.

TABLE 2A-7
NO ACTION
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

FEDERAL LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	5		8	8
Transportation Corridor- Collector Roads		8	86	49
Transportation Corridor- Local Roads		4	35	19
Transportation Corridor- Resource Roads		17	138	67
Gathering Pipelines/Utilities		12	53	0
Interconnect Pipeline		6	29	0
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			349	143
Raptor Restricted[1]				
Production Wells	1		1	1
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		0	0	0
Transportation Corridor- Resource Roads		<0.5	3	2
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			4	3
Winter Closure[1]				
Production Wells	1		2	2
Transportation Corridor- Collector Roads		3	32	19
Transportation Corridor- Local Roads		<0.5	4	2
Transportation Corridor- Resource Roads		1	10	5
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			48	28

TABLE 2A-7
NO ACTION
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

UDWR LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	28		39	39
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		8	73	39
Transportation Corridor- Resource Roads		11	92	45
Gathering Pipelines/Utilities		5	22	0
Interconnect Pipeline		0	0	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Total			238	135
Winter Closure[1]				
Production Wells	22		31	31
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		8	71	38
Transportation Corridor- Resource Roads		10	80	38
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			182	107

UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	69		97	97
Transportation Corridor- Collector Roads		6	53	31
Transportation Corridor- Local Roads		1	13	7
Transportation Corridor- Resource Roads		31	253	122
Gathering Pipelines/Utilities		5	20	0
Interconnect Pipeline		9	41	0
Compressor Sites	5		25	25
Injection Wells	2		16	16
Evaporation Ponds	2		8	8
Total			526	306
Winter Closure[1]				
Production Wells	28		39	39
Transportation Corridor- Collector Roads		4	38	22
Transportation Corridor- Local Roads		1	9	5
Transportation Corridor- Resource Roads		12	96	46
Compressor Sites	3		15	15
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			197	127

TABLE 2A-7
NO ACTION
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

PRIVATE LANDS

Facility	No.	Miles	Acres Disturbed	
			Short-Term	Long-Term
Production Wells	126		177	177
Transportation Corridor- Collector Roads		2	20	11
Transportation Corridor- Local Roads		10	90	48
Transportation Corridor- Resource Roads		56	449	218
Gathering Pipelines/Utilities		9	40	0
Interconnect Pipeline		1	6	0
Compressor Sites	0		0	0
Injection Wells	1		8	8
Evaporation Ponds	1		4	4
Total			794	466
Winter Closure[1]				
Production Wells	14		19	19
Transportation Corridor- Collector Roads		1	9	5
Transportation Corridor- Local Roads		2	17	9
Transportation Corridor- Resource Roads		8	68	33
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			113	66

TABLE 2A-7
NO ACTION
SOURCES AND EXTENT OF PROPOSED DISTURBANCE

TOTAL LANDS

Facility	No.	Miles	Acres Disturbed Short-Term	Acres Disturbed Long-Term
Production Wells	228		321	321
Transportation Corridor- Collector Roads		16	159	91
Transportation Corridor- Local Roads		23	211	113
Transportation Corridor- Resource Roads		115	932	452
Gathering Pipelines/Utilities		31	135	0
Interconnect Pipeline		16	76	0
Compressor Sites	5		25	25
Injection Wells	4		32	32
Evaporation Ponds	4		16	16
Total			1907	1050
Raptor Restricted[1]				
Production Wells	1		1	1
Transportation Corridor- Collector Roads		0	0	0
Transportation Corridor- Local Roads		0	0	0
Transportation Corridor- Resource Roads		<0.5	3	2
Compressor Sites	0		0	0
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			4	3
Winter Closure[1]				
Production Wells	65		91	91
Transportation Corridor- Collector Roads		8	79	46
Transportation Corridor- Local Roads		11	101	16
Transportation Corridor- Resource Roads		31	254	84
Compressor Sites	3		15	15
Injection Wells	0		0	0
Evaporation Ponds	0		0	0
Total			540	252

[1] Disturbance in Raptor Restricted and Winter Closure areas is a subset of total disturbance shown for each land ownership category; thus, Raptor Restricted and Winter Closure categories do not represent additional disturbance.

APPENDIX 2B
VEHICLE TYPE AND ROUND TRIP FREQUENCY FOR FIELD DEVELOPMENT AND OPERATIONS

APPENDIX 2B
VEHICLE TYPE AND ROUND TRIP FREQUENCY FOR FIELD DEVELOPMENT AND OPERATIONS

Facility/Activity	Vehicle	Trip Frequency
Access Road and Well Pad Construction	Haul Truck for Dozer	1/10 well locations, 1/10 miles of road
	Haul Truck for Grader	1/10 well locations, 1/10 miles of road
	Water Truck (100 bbl)	4/well, 21/mile of road
	Gravel Truck (20 yard)	19/well, 80, 65, and 53/mi of collector, local, and resource road, respectively
	Misc. Supplies/Pick-up	16/mile
Pipelines/Flowlines Installation	Haul Truck for Dozer	5/10 mi of flowline
	Haul Truck for Ditcher	1/10 mi
	Haul Truck for Side Boom	4/10 mi
	Haul Truck for Fusion Machine	2/10 mi
	Haul Truck for Track Hoe	2/10 mi
	Misc. Supplies/Pick-up	25/mi
Electrical Distribution Lines Installation	Haul Truck for Dozer	5/10 miles of line
	Haul Truck for Ditcher	1/10 miles
	Haul Truck for Track Hoe	2/10 miles
	Wire Truck	4/mile
	Misc. Supplies/Pick-up	10/mile
Production Well Drilling, Completion, Testing, and Installation		
Well Drilling	Truck Mounted Rig	1/well
	Support Trucking	2/well
	Casing Tong Truck	1/well
	Mud Truck*	3/well
	Fuel Truck	1/well
	Rig Crews/Pick-up	3/day
	RGC Supervisor/Pick-up	2/day
	Mud Engineers Truck*	1/day
	Casing Haul Truck	1/well
	Cementers, Pump Truck	1/well
	Bulk Truck	1/well
	Cementers/Pick-up	3/well
	Loggers/Logging Truck	1/well
	Loggers, Engineers Vehicle	1/well
	Frac Tanks	8/well
	Casing Crew Truck	1/well
	Misc. Supplies/Pick-up	16/well

APPENDIX 2B
(Continued)
VEHICLE TYPE AND ROUND TRIP FREQUENCY
FOR FIELD DEVELOPMENT AND OPERATIONS

Facility/Activity	Vehicle	Trip Frequency
Well Completion and Stimulation	Completion Unit/Rig	1/well
	Completion Equipment Truck	1/well
	Completion, Crew Pick-up	12/well
	Completion Pusher	3/well
	RGC Supervisor	2/well
	Tubing Trucks	1/well
	Service Tools	2/well
	Loggers/Truck	1/well
	Perforators	1/well
	Anchor Installation	1/well
	Frac Unit	1/well
	Water Truck (100 bbl)	46/well
	Pre Gel Blender	1/well
	Blender	1/well
	HT 400	6/well
	Materials	1/well
	Iron Truck	1/well
	Acid Transport	1/well
	Transferring Naphtha	1/well
	Fuel Truck	1/well
	Manifold Truck	1/well
	Instrument Van	1/well
	Fuel Truck	1/well
	Misc. Supplies/Pick-ups	100/well
Well Site Facilities Installation	Welder Truck	10/well
	Water Truck (100 bbl)	10/well
	Equipment Delivery Truck	4/well
	Misc. Supplies/Pick-ups	40/well
Well Operations		
Well Workover	Service Unit	1/well
	Service Unit Equipment Truck	1/well
	Service Unit Crew Pick-up	5/well
	Pusher Truck	1/well
	RGC Supervisor Pick-up	3/well
	Misc. Supplies/Pick-ups	50/well
Operations	Pumper Pick-up	1/well/3 days
Road Maintenance		
Dust Control - Magnesium Chloride	Water Truck (100 bbl)	15/mi

APPENDIX 2B
(Continued)
VEHICLE TYPE AND ROUND TRIP FREQUENCY FOR FIELD DEVELOPMENT AND OPERATIONS

Facility/Activity	Vehicle	Trip Frequency
Compressor Site Installation and Operations		
Installation	Tractor Truck	16/site
	Equipment Delivery Truck	20/site
	Cement Truck	20/site
	Gang Truck	60/site
	2 Welding Trucks	60/site
	Pick-up	360/site
	Water Truck (100 bbl)	19/site
	Gravel Truck (20 yard)	67/site
Operations	Pick-up	2/day
	Gang Truck	1/week
	Water Truck	2/month
Injection Well Drilling, Completion, and Installation		
Well Drilling**		
Well Completion**		
Well Site Facilities Installation**		
Produced Water Evaporation Pond Construction	Haul Truck for Dozer	2/pond
	Haul Truck for Loader	2/pond
	Haul Truck for Track Hoe	2/pond
	Supply Truck	6/pond
	Misc. Supplies/Pick-ups	40/pond
	Water Truck (100 bbl)	11/pond
	Gravel Truck (20 yard)	56/pond
Reclamation - Wells/Roads	Haul Truck for Dozer	1/well, 1/ mile of road
	Haul Truck for Loader	1/well, 1/mile of road
	Dump Truck (20 yard)	120/mile of road
	Haul Truck for Agricultural Tractor	1/well, 1/mile of road
	Misc. Supplies/Pick-ups	24/well, 24/mile of road

APPENDIX 2B
(Continued)
VEHICLE TYPE AND ROUND TRIP FREQUENCY FOR FIELD DEVELOPMENT AND OPERATIONS

Facility/Activity	Vehicle	Trip Frequency
Reclamation - Compressor Facility	Haul Truck for Dismantled Equipment	20/facility
	Haul Truck for Dozer	1/facility
	Haul Truck for Loader	1/facility
	Haul Truck for Agricultural Tractor	1/facility
	Misc. Supplies/Pick-ups	400/facility

* If mud is required.

** Vehicle and trip requirements similar to those for a production well.

APPENDIX 2C
BLM ROAD DESIGN AND CLASSIFICATION

COLLECTOR ROADS
(CLASS I ROADS)

SECTION 1

SURVEY AND DESIGN

Definition - Collector roads are defined as all roads existing or planned which are necessary for support of existing facilities on multiple use resource management. The need for this system is presumed to exceed 50 years. Existing roads identified as Collectors but which do not presently meet these standards may continue in service at their present standard; however, if maintenance or upgrading activities extend beyond the present limits of disturbance, the work will be done to Collector standards. All new construction of Collector roads will be done to Collector standards.

1. Field Survey Requirements

(A) Establish a "P" (preliminary) line survey along the route shown on the BLM's Transportation Plan Maps.

(B) "P" line stationing shall be located to follow the route line with station intervals not exceeding 300 feet.

(C) Horizontal angular error of closure between "P" line stations shall be ± ½° if forward and backward bearings are used, or ± 5 minutes if deflection angles are used.

(D) Horizontal distances between "P" line stations shall be accurate to within 1 foot in 300 feet.

(E) Vertical error of closure between "P" line stations shall be within 4 feet per mile, or .1 foot per station.

(F) Topographic data at each "P" line stations (both right and left) shall be within 1 foot in 100 feet.

(G) Location of significant features (pipelines, drainages, etc.) shall be required when within 100 feet of the "P" line.

(H) The "P" line shall be tied to land grid survey corners at the beginning and ending points, as well as at intermediate points that are within ¼ mile of the "P" line.

2. Design Requirements

All roads constructed by non-government entities across public lands must be designed by or under the direction of a licensed professional engineer. BLM Manual 9113.06F.

(A) Plot vertical, horizontal and topographic data, as well as significant features, on standard plan profile sheets to a scale of 1" = 100 feet.

(B) Plot "L" (layout) line along "P" (preliminary) line using th following design standards criteria:

(1) Design speed 25 mph.

(2) Travel way width - minimum 20 feet, maximum 30 feet (exceptions may be made to width requirements if approved by BLM prior to construction.)

(3) Minimum horizontal curve radius, 200 feet (unless a shorter radius is approved by BLM.)

(4) Minimum length of vertical curves (see attached graph.)

(5) Maximum grade 10 percent (except pitch grades*.)

(6) Mass diagrams and earthwork balancing will not be required: however, obvious areas of waste or borrow shall be noted on the plan and profile as well as proposed locations of borrow or waste disposal areas.

(7) All culverts shall be deigned for a 25 year frequency storm with an allowable head of one foot at the pipe inlet. Show all culverts planned to accurate vertical scale on plan profile sheets. The minimum size culvert shall be 18 inches.

(8) Aggregate surfacing shall be as required to reduce erosion of the road surface. The need for surfacing and the required thickness shall be determined by rainfall, subgrade strength, weight and repetitions of axle leads and the season of use.

The Company shall submit to the BLM two copies of the completed design (plan-profile) sheets along with calculations made to determine the size of any culverts. The BLM will review the proposed design and approve or suggest correction to the Company within ten working days of the receipt of such designs. The design shall be approved by the BLM prior to beginning construction.

3. <u>Construction Control</u>

(A) Determine "P" line to "L" line offsets to within ± 3 feet (horizontal).

(B) Establish the "on the ground" centerline location of the "L" line with 1"x 2"x 16" wood stakes. Location of field stakes shall be such that positive control of the road location is assured, but shall not exceed 300 feet.

* Pitch grades are defined as those grades exceeding 10 percent which are necessary because of topography. Such grades shall not extend over 300 feet in length, nor shall they be used to circumvent the intent of these stipulations. Maximum pitch shall be 12 percent.

(C) Establish reference points for the "L" line at approximate intervals of 300 feet. Reference points may be slope stakes or center line offsets. Reference points shall contain cut or full information for the "L" line station they reference.

(D) Show cut or fill required on each centerline station.

THE COMPANY SHALL PROVIDE A COMPETENT ON-SITE INSPECTOR DURING CONSTRUCTION OF THE ROAD TO INSURE COMPLIANCE WITH ALL STIPULATIONS. THE INSPECTOR SHALL BE DESIGNATED AT THE PRE-DRILL CONFERENCE, AND SHALL BE GIVEN AN APPROVED COPY OF ALL DRAWINGS AND STIPULATIONS PRIOR TO START OF CONSTRUCTION. THE BLM WILL ALSO DESIGNATE A REPRESENTATIVE FOR THE PROJECT AT THE PRE-DRILL CONFERENCE.

SECTION 2

CONSTRUCTION STANDARDS

1. Public Convenience and Safety

The Company shall provide, erect, and maintain all necessary signs and other traffic control devices as may be deemed necessary by the BLM and shall take all necessary precautions for the protection of the work and safety of the public during construction of the road.

Warning signs shall be posted wherever directed during blasting operations.

2. Clearing and Grubbing

All clearing and grubbing shall be confined to the limits of actual construction unless otherwise authorized by the BLM.

All surface objects and all trees, stumps, roots and other protruding obstructions not designated to remain shall be cleared and/or grubbed.

Low hanging branches and unsound or unsightly branches on trees or shrubs designated to remain shall be trimmed as directed. Branches of trees extending over the roadbed shall be trimmed to give a clear height of 20 feet above the roadbed surface. All perishable material resulting from clearing grubbing operations shall be disposed of through one of the following methods:

(A) By Burning: If perishable material is burned, it shall be burned under the constant care of competent watchmen at such times and in such a manner that the surrounding vegetation, other adjacent property or anything designated to remain on the right-of-way will not be jeopardized. If permitted, burning shall be done in accordance with applicable laws, ordinances and regulations.

In the event that the Company is directed by the BLM not to start burning operations or to suspend such operations because of hazardous weather conditions, material to be burned which interferes with subsequent construction operations shall be moved to temporary locations clear of construction operations and later placed on a designated spot and burned.

(B) By Burying: Materials and debris which cannot be burned and perishable materials may be disposed of by methods and at locations approved on or off the project. If disposal is by burying, the debris shall be placed in layers with the materials so distributed to avoid nesting. Each layer shall be covered or mixed with earth material by the landfill

method to fill all voids. The top layer of material buried shall be covered with at least 24 inches of earth or other approved material and shall be graded, shaped and compacted to present a pleasing appearance.

(C) By Chipping: Woody material smaller than 3-inch diameter may be disposed of by chipping. The wood chips may be used for mulch, slope erosion control, or may be uniformly spread over selected areas as directed by the BLM. Woody material larger than 3-inch diameter shall be disposed of as directed by BLM.

3. Excavation

Prior to beginning excavation and fill placement operations, all vegetation or debris within the designated limits of the roadway, except such objects as are designated to remain in place, are to be removed and disposed of as provided in paragraph #2. Al suitable material removed during excavation operation shall be used as far as practicable in the formation of the embankments. It should be noted that this may include end haul if fill placement is over 300 feet from the excavation areas.

4. Embankment Construction

Embankment material shall not be placed when either the materials or the surface on which they will be placed are frozen or too wet (as determined by BLM) for satisfactory compaction.

Embankment materials shall be placed parallel to the axis of the roadway in even, continuous, approximately horizontal layers not more than 8 inches in thickness. The full cross sections of the fill shall be maintained as each successive layer is placed. Successive layers of material shall be placed on embankment ares so as to produce the best practical distribution of the material. The distribution of the materials throughout the embankment shall be such that is shall be free from lenses, pockets, streaks or layers of material differing substantially in texture, gradation or compaction from the surrounding material. The combined excavation and placing operation shall be such that the materials when placed in the embankment shall be blended sufficiently to secure the best practicable degree of compaction and stability.

No stone that fail to pass a 3-inch quare opening shall be left within 4 inches of the finished surface.

The Contractor shall route his construction equipment over the layers of embankment material already in place and shall distribute the travel evenly over the entire width of the embankment os as to obtain the maximum compaction while placing the material and to avoid uneven compaction anywhere along the travel route.

Borrow material shall not be used until all of the accessible roadway excavation has been placed in the embankments unless otherwise permitted by the BLM. Borrow areas used by the Contract shall be approved by the BLM prior to the start of the excavation. Borrow areas shall be smoothed and left in a pleasing appearance.

Roadside ditches shall conform to the slope, grade and shape of the required cross section, with no projections of roots, stumps, rocks or similar matter. Roadside ditches shall be "V" type ditches excavated to a depth of 1 foot minimum below finished road surface. Roadside ditch back slopes shall not be cut flatter than 3:1. Roadside ditch "turn outs" shall be constructed at intervals not exceeding 500 feet when the cross slope does not exceed 5 percent.

Excess excavation material shall be used insofar as practical to improve the road grade line or "flatten" fill slopes. Other waste areas shall be approved by BLM prior to placement of waste material.

All slopes, shoulders and road surfaces shall be finished smoothly and in accordance with the lines and grades shown on the drawings and as staked.

5. <u>Culvert Pipe Installation</u>

(A) <u>Materials</u>

The Company shall furnish all corrugated metal or aluminum pipe of the types, sized, gages and lengths shown on the approved design sheets. Galvanized corrugated metal pipe shall be new and conform to the requirements of AASHO M36. All spots on the pipe where the zinc coating has been injured or destroyed shall be painted with two coats of hot asphaltic paint or otherwise repaired in a satisfactory manner. In no case shall pipes be dragged on the ground.

(B) <u>Excavation</u>

Excavation of trenches for pipe culverts shall be to the lines and grades or elevations shown on the plans or as staked on the ground. Culvert outlets shall be at ground level unless otherwise approved by BLM. The width of the pipe trench shall be two feet wider than the pipe diameter to permit satisfactory placement of the pipe and thorough tamping of the bedding material under and around the pipe.

(C) <u>Bedding</u>

Bed the culvert pipe in a trench cut in natural ground or existing embankment to a depth of not less than 30 percent of the outside pipe diameter plus the thickness of bedding material. The pipe shall be bedded on a minimum of four inches of fine, well graded material. Such material shall be

free of stones larger than one-half (½) inch in diameter, sticks and other deleterious matter and shall be the best material available at the site. The completed trench and bedding shall be approved by the BLM prior to the installation of the pipe.

(D) Backfill

After the trench and bedding have been approved by the BLM, the pipe may be installed. The pipe shall be laid carefully and true to line and grades as given. Any pipe which is not in true alignment or which shows any undue settlement after being laid, or is damaged, shall be taken up and relaid or replaced. The trench shall then be backfilled with well graded compactable soil selected from excavation or borrow. The material shall be placed along each side of the pipe in layers not over six (6) inches in depth. Each layer of material shall then be thoroughly compacted with hand or mechanical tampers or other approved methods. Special care shall be taken to compact thoroughly the material under the haunches of the pipe and to insure that the backfill material is in intimate contact with the sides of the pipe. The backfill shall be brought up evenly on both sides of the pipe to a depth of at least two feet above the top of the pipe and for its full length.

The completed culvert pipe installation shall be smoothly finished upon completion and shall fully serve the intended purpose.

6. Seeding

(A) The Company shall carry out erosion control items of vegetation establishment during the season established for seeding. Vegetation establishment shall be completed on areas of disturbance as they are completed if actual construction is being accomplished during the seeding season.

Seeding shall be carried out on all of the areas described as follows:

(1) On cut slopes, and shall extend from the bottom of the ditch to the top of the cut slope.

(2) On embankment slopes, and shall extend from the roadway shoulder to the toe of the embankment slope.

(3) On all areas used for disposal of clearing and grubbing debris.

(4) On all borrow pit areas.

(5) On all "side cast" in areas of full bench construction.

(B) Seeding season shall be from September 15 to December 15, or as otherwise allowed by the BLM.

(C) Seed application will be by seed drill or broadcasted and harrowed; other methods will require prior BLM approval.

(D) Species and application rates are as follows:

Type of Grass Seed	Application Rate*

* These rates will be increased by 2.5 times if seed is broadcasted.

THE COMPANY SHALL COMPLETE CONSTRUCTION OF THIS ROAD IN ACCORDANCE WITH ALL STIPULATIONS AND HAVE IT APPROVED BY BLM PRIOR TO WELL SPUDDING.

SECTION 3

ROAD MAINTENANCE STANDARDS

The completed road shall be maintained to the following standards as applicable for the term of the use.

1. Travel Way

   (A) Roadbed is smooth, free of ruts, chuckholes, rocks, slides, washboards; crowned and/or sloped for drainage.

   (B) Free from excessive accumulation of dust pockets of layers which are a driving hazard or public nuisance.

   (C) Berms shall be absent along the shoulder.

   (D) Soft spots, such as those resulting from springs and seeps, shall be absent.

2. Shoulders

   (A) Shoulders are straight and present a uniform line with the surface free from large rocks, limbs, or stumps.

3. Ditches

   (A) Original cross section shall be maintained. Drainage area clear of rocks, slides and sediments.

   (B) Vegetation or sedimentation does not restrict ditch flow or reduce the waterway area.

   (C) Ditch bottom is stable and is not excessively eroded.

   (D) Back slope area above ditches is stable.

4. Culverts

   (A) The barrel is uniform in shape, free from bends which may restrict the flow, separations, rust wear holes, sedimentation, obstruction, and have sufficient cover to protect the pipe.

   (B) The entrance is the original shape, free from bends, tears, brush, or debris.

   (C) No excessive camber or reverse camber which cause water pockets in the pipe.

   (D) Erosion at inlets and outlets is controlled.

(E) Riprap is stable and free from undercutting.

5. Other Related Road Features

(A) Right-of-way free of excessive or objectional litter.

6. Fences, Gates and Cattleguards

(A) Posts are sound, plumb and secure.

(B) Wire is tight and securely fastened to the posts.

(C) Stays are uniformly spaced and vertical between posts and affixed to keep the strands properly spaced.

(D) Rock deadmen are properly secured to the fence.

(E) Gates are free from deterioration, damage to structural sections or loose hardware.

(F) Cattleguard pits are clean and functional. End wings securely fastened and in serviceable condition. Cattleguard and base in serviceable condition.

7. Fords and Low Water Crossings

(A) There is a smooth transition between road and ford.

(B) No excessive erosion adjacent to the structure.

(C) The surface of the structure is clear of debris, brush, rocks and sediment.

(D) Bottom of crossing is level with stream bottom.

8. Safety and Hazard Control

(A) Sight distance free of shrubs, trees and obstacles and meets design standards.

(B) Travel way and ditches free of overhanging trees and limbs. No down trees or branches in ditch area.

(C) No unstable material above the roadway.

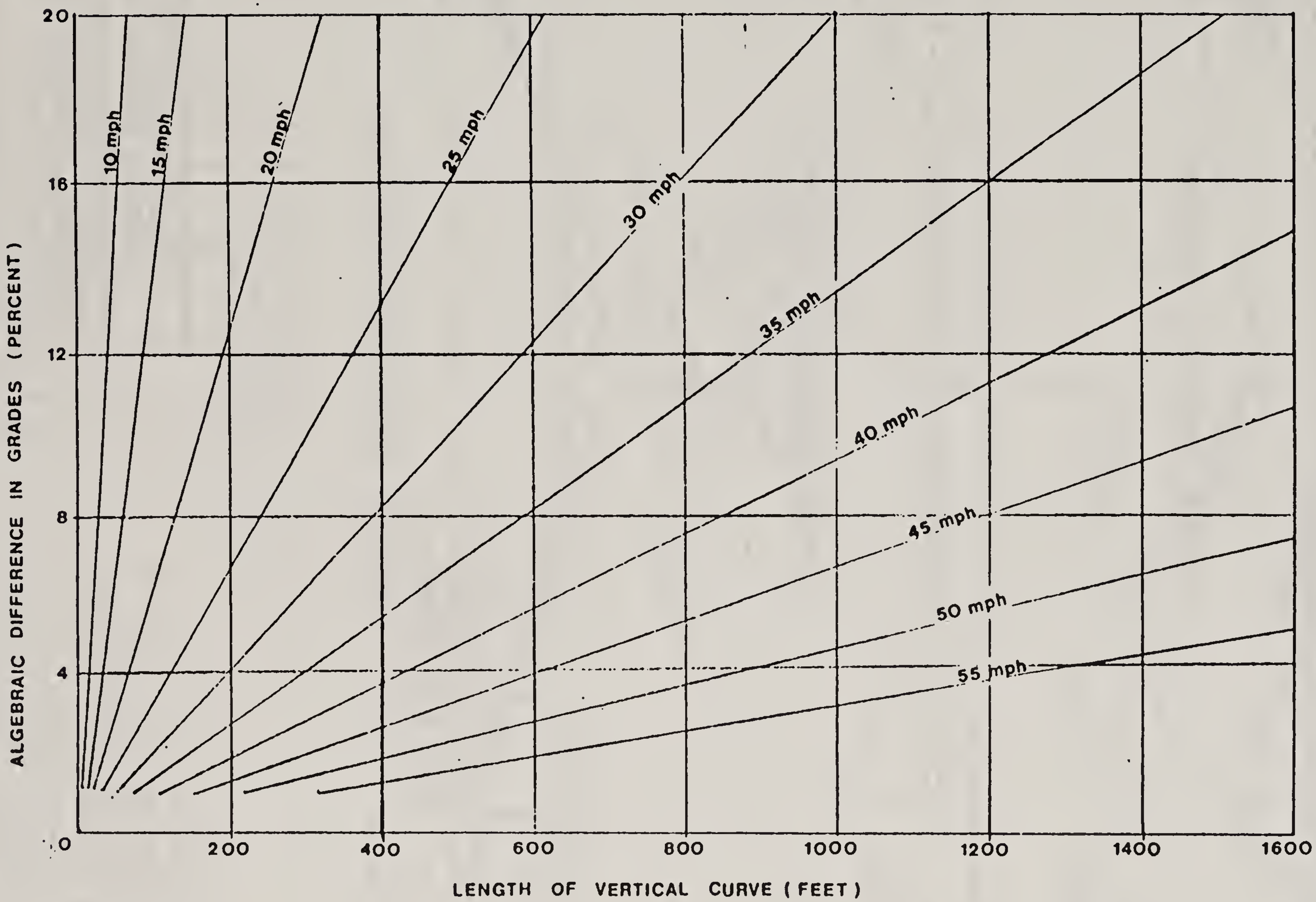
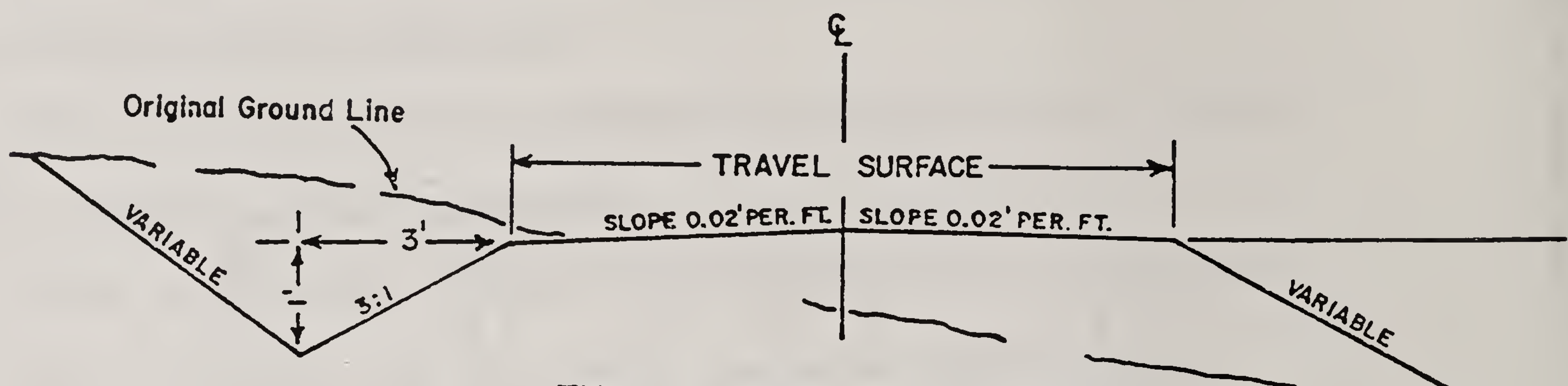
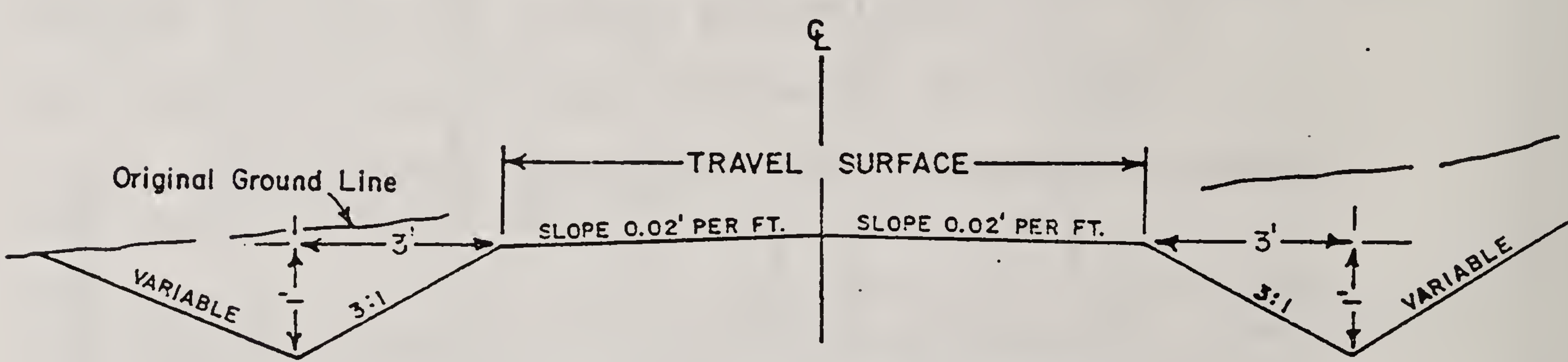


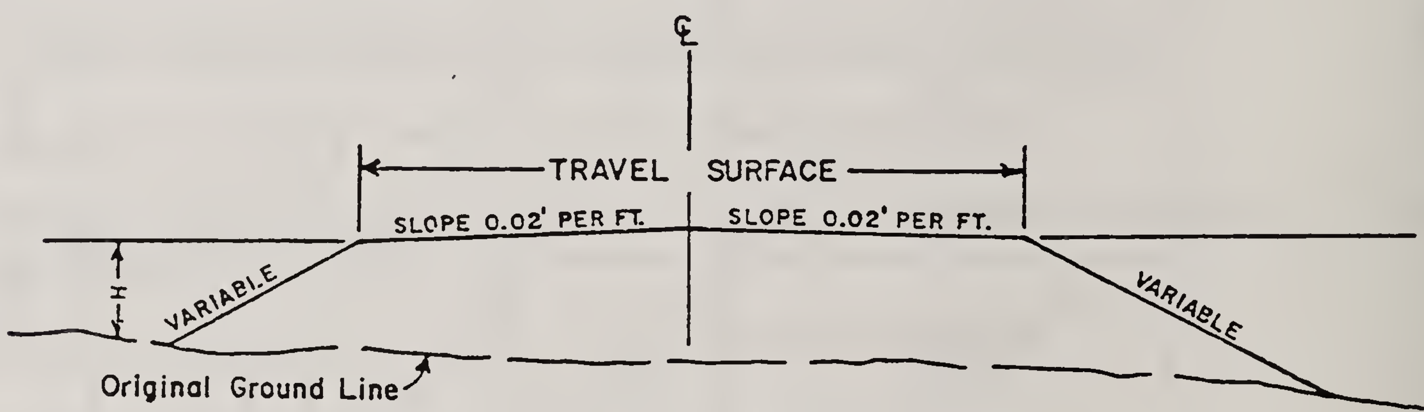
Chart For Estimating Length Of Vertical Curves



TYPICAL SIDE HILL SECTION



TYPICAL FULL CUT SECTION



TYPICAL EMBANKMENT SECTION

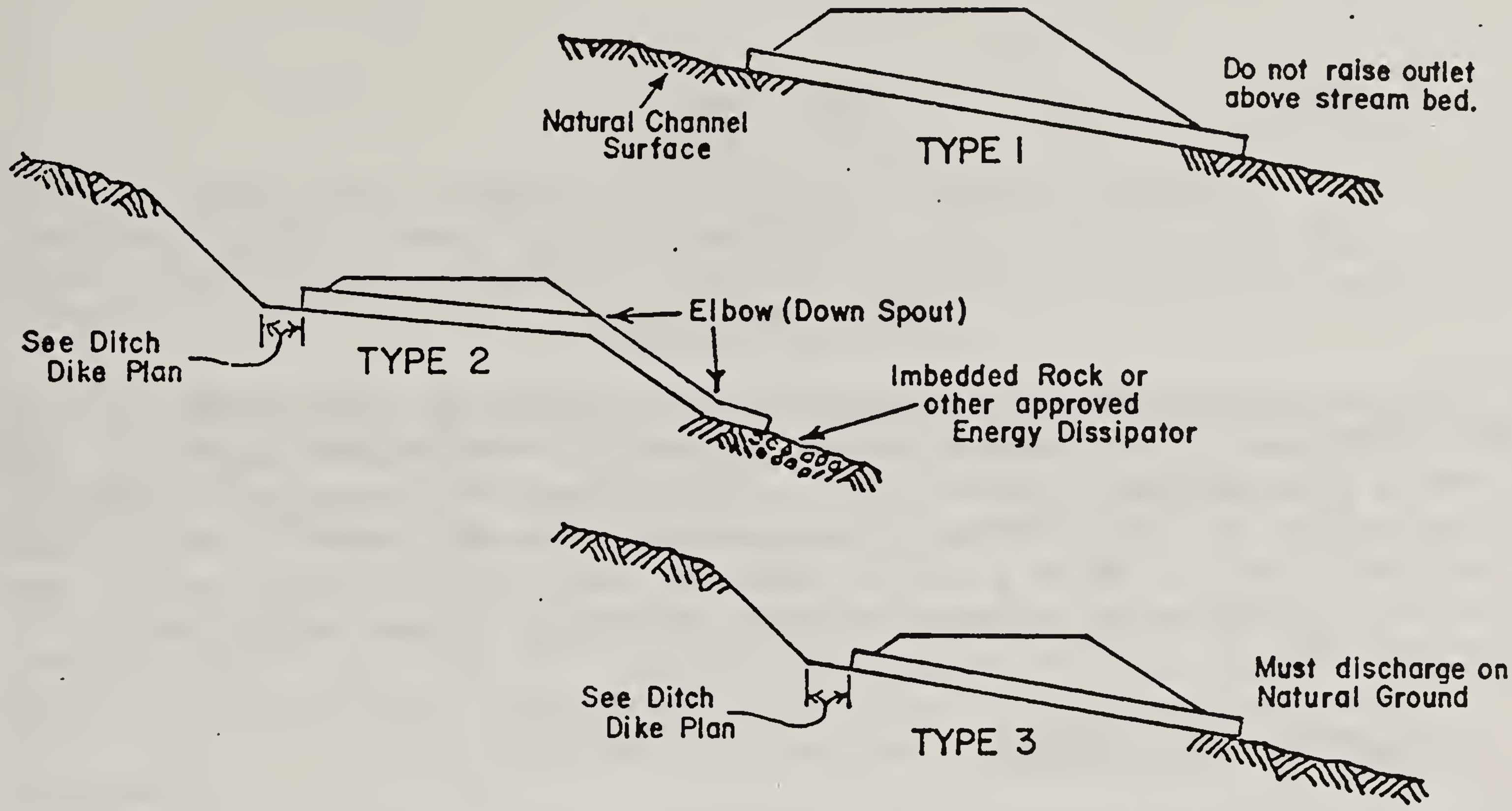
Height of Cut or Fill	Cut Slope	Fill Slope
0' – 3'	3 : 1	4 : 1
3' – 10'	2 : 1	3 : 1
OVER 10'	1½ : 1	2 : 1
ROCK	¼ : 1	—

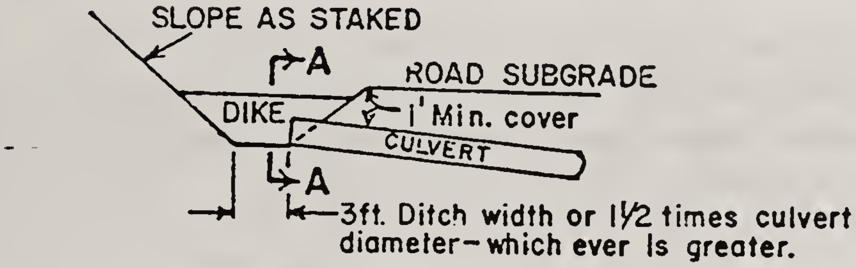
U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

TYPICAL ROAD SECTIONS

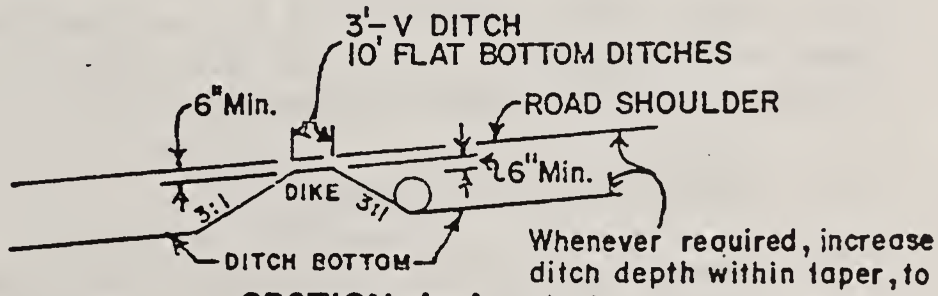
DESIGNED R.A.D.	RECOMM.
DRAWN J.H.S.	RECOMM.
CHECKED ZAP	APPROVED
SCALE NONE	
DATE 8-5-81	SHEET ___ OF ___
DRAWING NO.	

☆ GPO 850-178

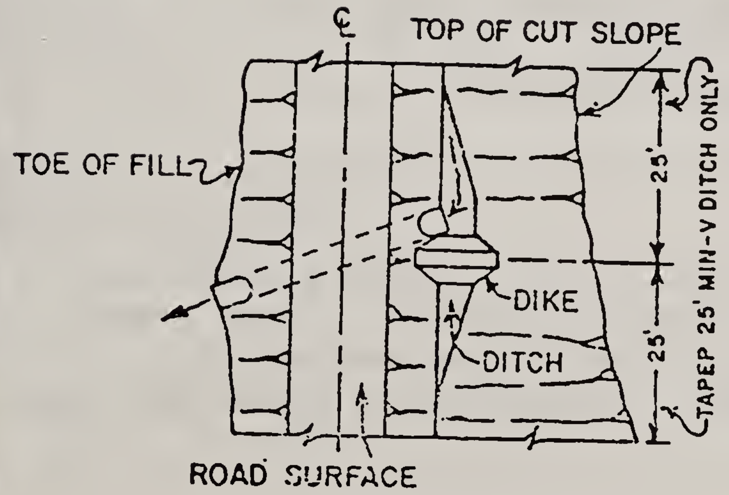




NORMAL SECTION



SECTION A–A



PLAN VIEW

DITCH DIKE

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

TYPICAL CULVERT INSTALLATIONS

DESIGNED R.A.D.	RECOMM.
DRAWN J.H.S.	RECOMM. [illegible]
CHECKED [illegible]	APPROVED [illegible]
SCALE NONE	
DATE 8-5-81	SHEET __ OF __
DRAWING NO.	

☆ GPO 850-178

LOCAL ROADS
(CLASS II ROADS)

SECTION I

SURVEY AND DESIGN

Definition - Local roads are those existing or proposed roads which will serve the development of a depletable natural resource or temporary facility. When these roads are no longer required for access, they will be rehabilitated. If it is determined by the controlling authority (prior to rehabilitation) that the road continues to serve a useful purpose, that authority may retain the road as part of its active transportation system and assume maintenance responsibilities.

1. Field Survey Requirements

   (A) Establish a flag line survey along the route shown on the BLM's Transportation Plan Maps.

   (B) Flag line stationing shall be located to follow the route line with station intervals not exceeding 100 feet, or be intervisible, whichever is less.

   (C) Any significant deviation from the route line established by BLM (as shown on the Transportation Plan Maps) shall be approved by BLM prior to construction.

2. Design Requirements

   All Local roads constructed by non-government entities across public lands must be designed by or under the direction of a licensed professional engineer (BLM Manual 9113.06 F).

   (A) Design speed, 20 mph.

   (B) Travel way width, minimum 20 feet, maximum 24 feet (exceptions may be made to width requirements if approved by BLM prior to construction).

   (D) Minimum length of vertical curves (see attached graph).

   (E) Maximum grade, 10 percent (except pitch grades*).

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* Pitch grades are defined as those grades exceeding 10 percent which are necessary because of topography, i.e., low water crossings. Such grades shall not extend over 300 feet in length, nor shall they be used to circumvent the intent of these stipulations. Maximum pitch grade shall be 16 percent.

Mass diagrams and earthwork balancing will not be required; however, obvious areas of waste or borrow shall be noted on the road location map, as well as proposed locations of borrow or waste disposal areas.

(F) All culverts shall be designed for a 10-year frequency storm with an allowable head of one foot at the pipe inlet. All culverts planned shall be sized in accordance with accepted engineering practices. The minimum size culvert shall be 18 inches.

(G) Drainage dips shall be placed to control backslope and travel surface runoff on side hill sections when such drainage is not controlled by rolling topography on culverts. Dip placement shall be in accordance with the table in Section 2, paragraph 6, of these standards.

(H) Aggregate surfacing shall be as required to reduce erosion of the road surface. The need for surfacing and the required thickness shall be determined by rainfall, subgrade strength, weight and repetitions of axle loads, and the season of use.

The Company shall submit to the BLM two copies of a road location map showing grades in excess of 10 percent, culvert location, as well as calculations made to determine the size of any culverts. The BLM shall review the proposed design and approve or suggest correction to the Company within ten (10) working days of the receipt of such maps.

3. Construction Control

The road shall be constructed along the approved flag line. All fill sections over three feet high shall be marked with 1' x 2' wood stakes on centerline showing the amount of fill. Road centerline flags or stakes shall be placed at maximum intervals of 300 feet.

THE COMPANY SHALL PROVIDE A COMPETENT ON-SITE INSPECTOR DURING CONSTRUCTION OF THE ROAD TO INSURE COMPLIANCE WITH ALL STIPULATIONS. THE INSPECTOR SHALL BE DESIGNATED AT THE PRE-DRILL CONFERENCE, AND SHALL BE GIVEN AN APPROVED COPY OF ALL MAPS AND STIPULATIONS PRIOR TO START OF CONSTRUCTION.

THE BLM WILL ALSO DESIGNATE A REPRESENTATIVE FOR THE PROJECT AT THE PRE-DRILL CONFERENCE.

SECTION 2

CONSTRUCTION STANDARDS

1. Public Convenience and Safety

The Company shall provide, erect, and maintain all necessary signs and other traffic control devices as may be deemed necessary by the BLM and shall take all necessary precautions for the protection of the work and safety of the public during construction of the road.

Warning signs shall be posted wherever directed during blasting operations.

2. Clearing and Grubbing

Clearing and grubbing shall be carried out on all sections of the road where side slopes are less than 60 percent.

All clearing and grubbing shall be confined to the limits of actual construction unless otherwise authorized by the BLM.

All surface objects and all trees, stumps, roots and other protruding obstructions not designated to remain shall be cleared and/or grubbed, except as provided below:

Low hanging branches and unsound or unsightly branches on trees or shrubs designated to remain shall be trimmed as directed. Branches of trees extending over the roadbed shall be trimmed to give a clear height of 20 feet above the roadbed surface. All perishable material resulting from clearing and grubbing operations shall be disposed of through one of the following methods:

(A) By Burning: If perishable material is burned, it shall be burned under the constant care of competent watchmen at such times and in such a manner that the surrounding vegetation, other adjacent property or anything designated to remain on the right-of-way will not be jeopardized. If permitted, burning shall be done in accordance with applicable laws, ordinances and regulations.

In the event that the Company is directed by the BLM not to start burning operations or to suspend such operations because of hazardous weather conditions, material to be burned which interferes with subsequent construction operations shall be moved temporary locations clear of construction operations and later placed on a designated spot and burned.

(B) By Burying: Materials and debris which cannot be burned and perishable materials may be disposed of by methods and at locations approved on or off the project. If disposal is by burying, the debris shall be placed in layers with the materials so distributed to avoid nesting. Each layer shall be covered or mixed with earth material by the landfill method to fill all voids. The top layer of material buried shall be covered with at least 24 inches of earth or other approved material and shall be graded, shaped and compacted to present a pleasing appearance.

(C) By Chipping: Woody material smaller than three inch diameter may be disposed of by chipping. The wood chips may be used for mulch, slope erosion control, or may be uniformly spread over selected areas as directed by the BLM. Woody material larger than three inch diameter shall be disposed of as directed by BLM.

3. Excavation

Prior to beginning excavation and fill placement operations, all vegetation or debris within the designated limits of the roadway, except such objects as are designated to remain in place, are to be removed and disposed of as provided in Paragraph #2. All suitable material removed during excavation operation shall be used as far as practicable in the formation of the embankments.

4. Embankment Construction

Embankment material shall not be placed when either the materials or the surface on which they will be placed are frozen or too wet (as determined by BLM) for satisfactory compaction.

Embankment materials shall be placed parallel to the axis of the roadway in even, continuous, approximately horizontal layers not more than eight (8) inches in thickness. The full cross section of the fill shall be maintained as each successive layer is placed. Successive layers of material shall be placed on embankment areas so as to produce the best practical distribution of the material. The distribution of the materials throughout the embankment shall be such that it shall be free from lenses, pockets, streaks or layers of material differing substantially in texture, gradation or compaction from the surrounding material. The combined excavation and placing operation shall be such that the materials when placed in the embankment shall be blended sufficiently to secure the best practicable degree of compaction and stability.

The Contractor shall route his construction equipment over the layers of embankment material already in place and shall distribute the travel evenly over the entire width of the embankment so as to obtain the maximum compaction while placing the material and to avoid uneven compaction anywhere along the travel route.

Borrow material shall not be used until all of the accessible roadway excavation has been placed in the embankments, unless otherwise permitted by the BLM.

Roadside ditches shall conform to the slope, grade and shape of the required cross section, with no projections of roots, stumps, rocks or similar matter. Roadside ditches shall be "V" type ditches excavated to a depth of one foot minimum below finished road surface. All slopes, shoulders and road surfaces shall be finished smoothly and in accordance with the lines and grades shown on the drawings and as staked.

Roadside ditch backslopes shall not be cut flatter than 3:1. Roadside ditch "turn outs" shall be constructed at intervals not exceeding 500 feet when the cross slope does not exceed 5%.

5. Culvert Pipe Installation

(A) Materials

The Company shall furnish all corrugated metal or aluminum pipe of the types, sizes, gauges and lengths shown on the approved design sheets. Galvanized corrugated metal pipe shall be new and conform to the requirements of AASHO M36. All spots on the pipe where the zinc coating has been injured or destroyed shall be painted with two coats of hot asphaltic paint or otherwise repaired in a satisfactory manner. In no case shall pipes be dragged on the ground.

(B) Excavation

Excavation of trenches for pipe culverts shall be to the lines and grades or elevations shown on the plans or as staked on the ground. Culvert outlets shall be at ground level unless otherwise approved by BLM. The width of the pipe trench shall be two feet wider than the pipe diameter to permit satisfactory placement of the pipe and thorough tamping of the bedding material under and around the pipe.

(C) Bedding

Bed the culvert pipe in a trench cut in natural ground or existing embankment to a depth of not less than 30 percent of the outside pipe diameter plus the thickness of bedding material. The pipe shall be bedded on a minimum of four inches of fine well-graded material. Such material shall be free of stones larger than one-half (1/2) inch in diameter, sticks and other deleterious matter and shall be the best material available at the site.

(D) Backfill

After the trench and bedding have been completed, the pipe may be installed. The pipe shall be laid carefully and true to line and grades as given. Any pipe which is not in true alignment or which shows any undue settlement after being laid, or is damaged, shall be taken up and relaid or replaced. The trench shall then be backfilled with well graded compactable soil selected from excavation or borrow. The material shall be placed along each side of the pipe in layers not over six (6) inches in depth. Each layer of material shall then be thoroughly compacted with hand or mechanical tampers or other approved methods. Special care shall be taken to compact thoroughly the material under the haunches of the pipe and to insure that the backfill material is in intimate contact with the sides of the pipe. The backfill shall be brought up evenly on both sides of the pipe to a depth of at least two feet above the top of the pipe and for its full length.

6. Drainage Dip Construction

Drainage dips shall be spaced in accordance with the following table:

Road Grade %	Drainage Dip Spacing Feet
2	300
4	230
6	200
8	170
10	160

Culvert pipes shall be used for cross drains on grades in excess of 10%.

This table is intended as a guide only and may require adjustment in the field for site-specific conditions.

(A) Construction Requirements

Construction shall be as specified in paragraphs 3 and 4, and as shown on the drawings.

7. Seeding

(A) The Company shall carry out erosion control items of vegetation establishment during the season established for seeding. Vegetation establishment shall be completed on areas of disturbance as they are completed if actual construction is being accomplished during the seeding season.

Seeding shall be carried out on all of the areas described as follows:

(1) On cut slopes, and shall extend from the bottom of the ditch to the top of the cut slope.

(2) On embankment slopes, and shall extend from the roadway shoulder to the toe of the embankment slope.

(3) On all areas used for disposal of clearing and grubbing debris.

(4) On all borrow pit areas.

(5) On all "side cast" in areas of full bench construction.

(B) Seeding season shall be from September 15 to December 15, or as otherwise allowed by the BLM.

(C) Seed application will be by seed drill or broadcasted and harrowed; other methods will require prior BLM approval.

(D) Species and application rates are as follows:

Type of Grass Seed	Application Rate*

THE COMPANY SHALL COMPLETE CONSTRUCTION OF THIS ROAD IN ACCORDANCE WITH ALL STIPULATIONS AND HAVE IT APPROVED BY BLM PRIOR TO WELL SPUDDING.

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* These rates will be increased by 2½ times if seed is broadcast.

LOCAL ROADS

SECTION 3

ROAD MAINTENANCE STANDARDS

The completed road shall be maintained to the following standards as applicable for the term of use.

1. Travel Way

   (A) Roadbed is smooth, free of ruts, chuckholes, rocks, slides, washboards; crowned and/or sloped for drainage.

   (B) Free from excessive accumulation of dust pockets or layers which are a driving hazard or public nuisance.

   (C) Berms shall be absent along the shoulder.

   (D) Soft spots, such as those resulting from springs and seeps, shall be absent.

2. Shoulders

   (A) Shoulders are straight and present a uniform line with the surface free from large rocks, limbs, or stumps.

3. Ditches and Drainage Pits

   (A) Original cross section shall be maintained. Drainage area clear of rocks, slides and sediments.

   (B) Vegetation or sedimentation does not restrict ditch flow or reduce the waterway area.

   (C) Ditch bottom is stable and is not excessively eroded.

   (D) Back slope area above ditches is stable.

4. Culverts

   (A) The barrel is uniform in shape, free from bends which may restrict the flow, separations, rust, wear holes, sedimentation, obstructions, and have sufficient cover to protect the pipe.

   (B) The entrance is the original shape, free from bends, tears, brush, or debris.

(C) No excessive camber or reverse camber which cause water pockets in the pipe.

(D) Erosion at inlets and outlets is controlled.

(E) Riprap is stable and free from undercutting.

5. Other Related Road Features

(A) Right-of-way free of excessive or objectional litter.

6. Fences, Gates and Cattleguards

(A) Posts are sound, plumb and secure.

(B) Wire is tight and securely fastened to the posts.

(C) Stays are uniformly spaced and vertical between posts and affixed to keep the strands properly spaced.

(D) Rock deadmen are properly secured to the fence.

(E) Gates are free from deterioration, damage to structural sections or loose hardware.

(F) Cattleguard pits are clean and functional. End wings securely fastened and in the serviceable condition. Cattleguard and base in serviceable condition.

7. Fords and Low Water Crossings

(A) There is a smooth transition between road and ford.

(B) No excessive erosion adjacent to the structure.

(C) The surface of the structure is clear of debris, brush, rocks and sediment.

(D) Bottom of crossing is level with stream bottom.

8. Safety and Hazard Control

(A) Sight distance free of shrubs, trees and obstacles and meets design standards.

(B) Travel way and ditches free of overhanging trees and limbs. No down trees or branches in ditch area.

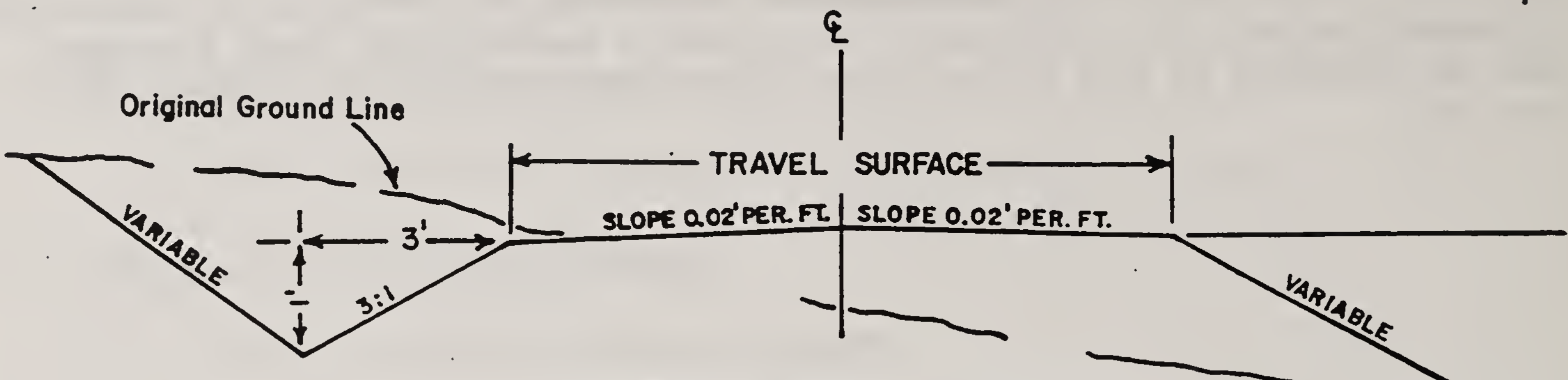
(C) No unstable material above the roadway.

CLASS II

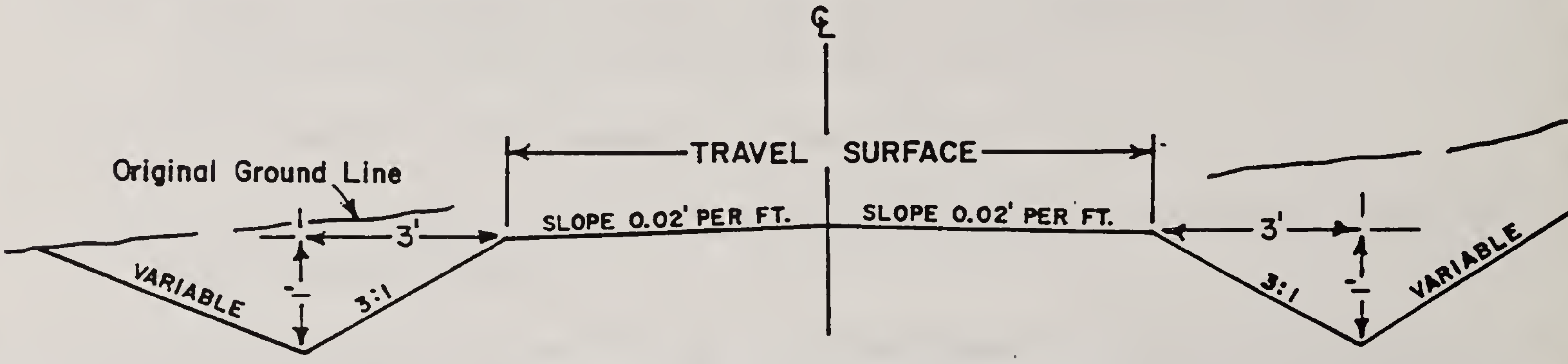
SECTION 4

ROAD RECLAMATION STANDARDS

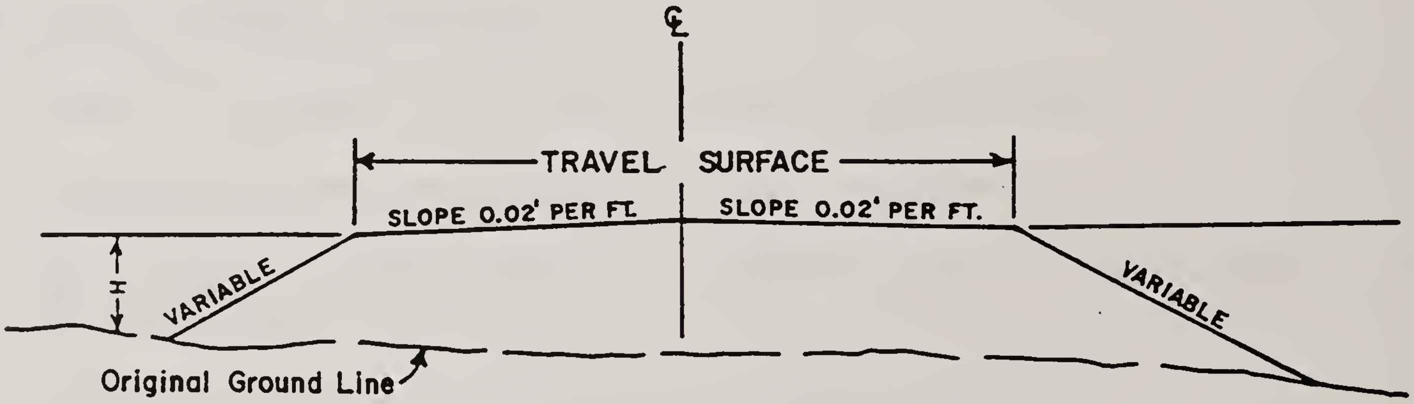
Roads servicing more than one operator or company will require a rehabilitation agreement between all principals for ultimate restoration. Such agreement must be approved by BLM prior to well abandonment by any of the companies involved.



TYPICAL SIDE HILL SECTION



TYPICAL FULL CUT SECTION



TYPICAL EMBANKMENT SECTION

Height of Cut or Fill	Cut Slope	Fill Slope
0' – 3'	3 : 1	4 : 1
3' – 10'	2 : 1	3 : 1
OVER 10'	1½ : 1	2 : 1
ROCK	¼ : 1	—

U. S. DEPARTMENT OF THE INTERIOR
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TYPICAL ROAD SECTIONS

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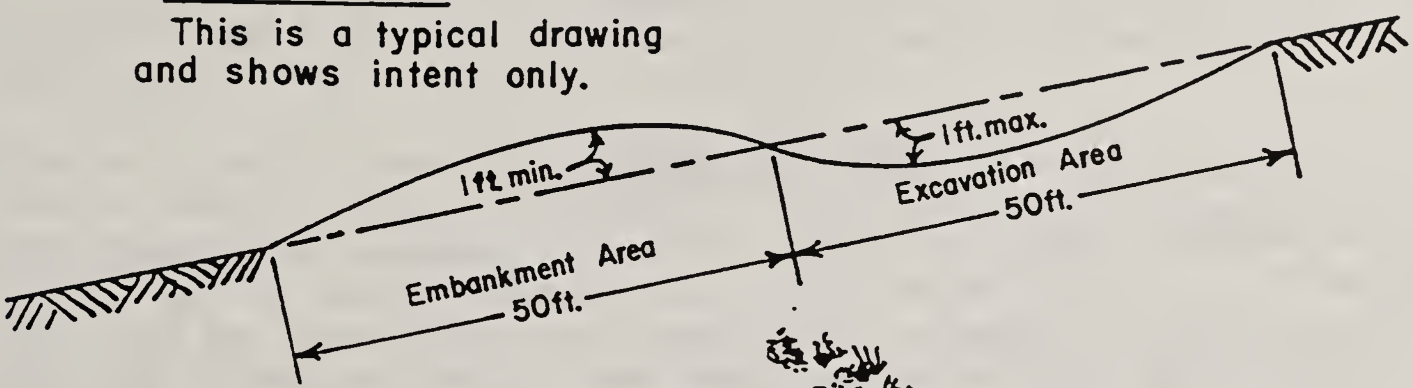
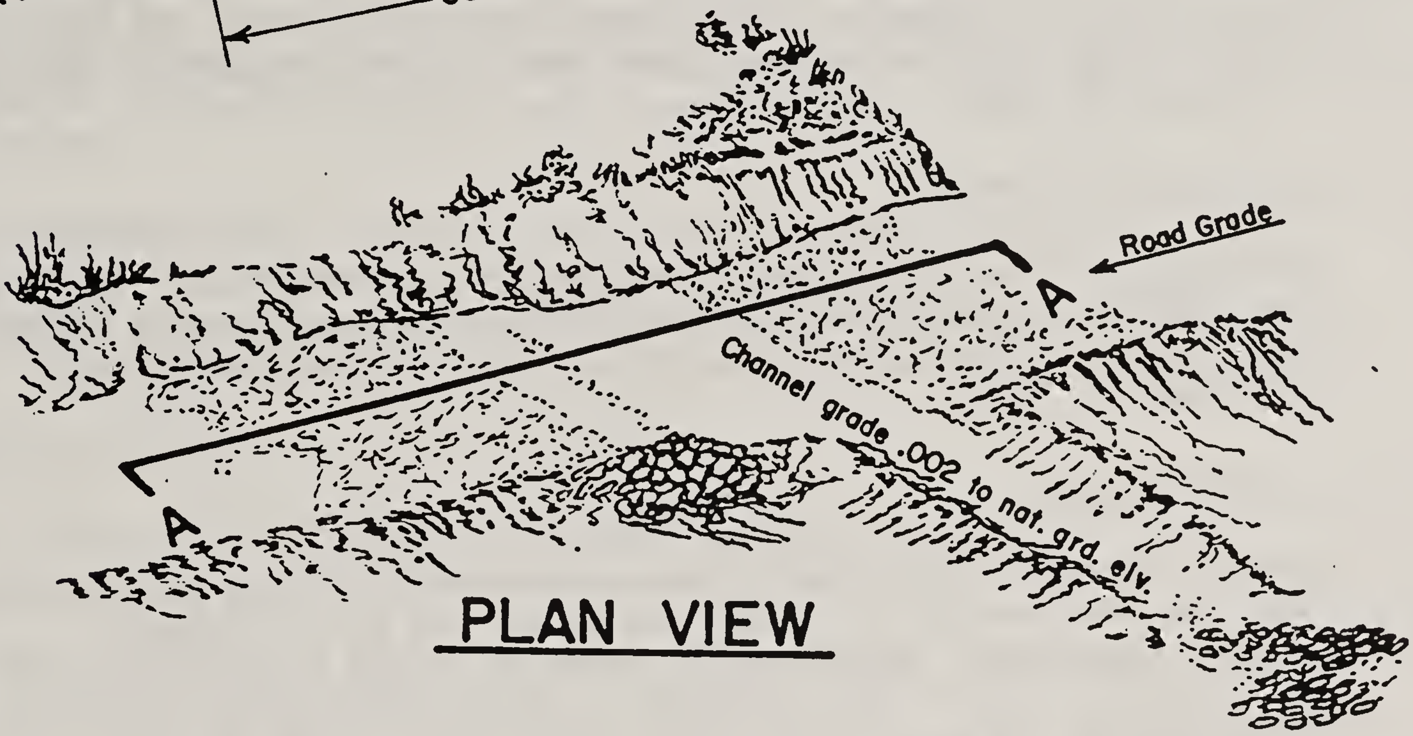
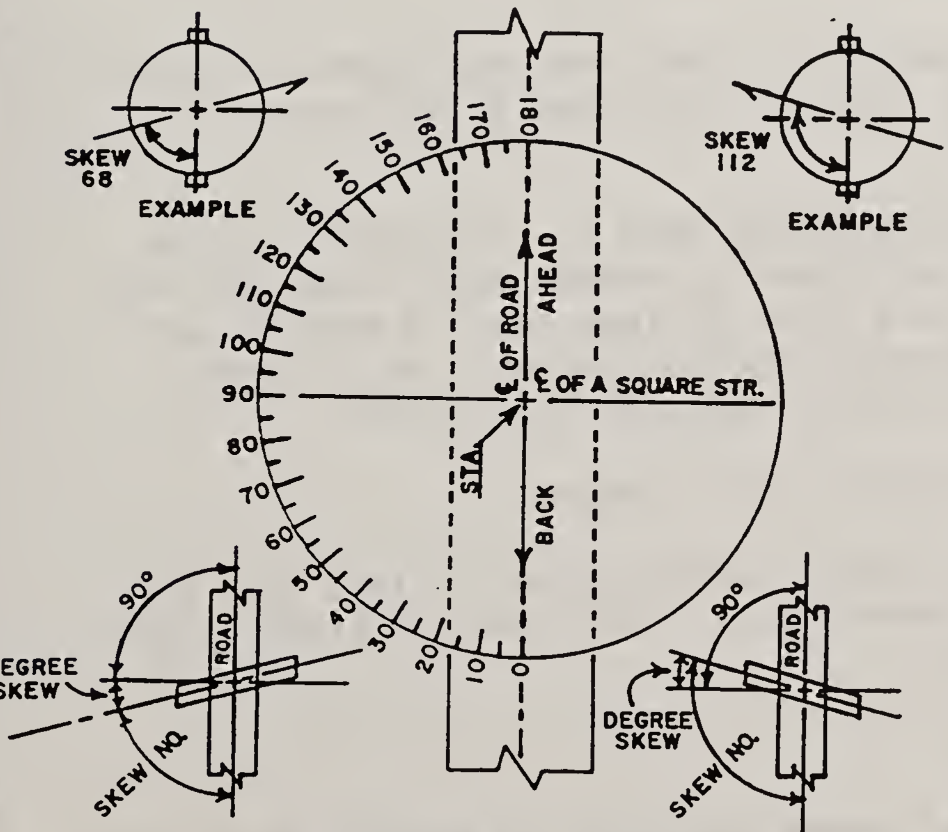
TYPICAL DRAINAGE DIP
SECTION A-A

NOTE:
This is a typical drawing and shows intent only.

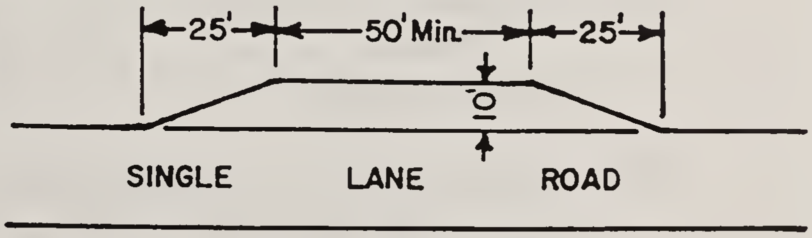




PLAN VIEW



SKEW NUMBER DEFINITION
(Culverts and Drainage Dips)



TYPICAL TURNOUT

ALWAYS THINK **SAFETY**

U. S. DEPARTMENT OF THE INTERIOR
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TYPICAL ROAD SECTIONS

DESIGNED R.A.D.	RECOMM.
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CHECKED RAD	APPROVED Colin P. Christen
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☆ GPO 850-178

RESOURCE ROADS
(CLASS III ROADS)

SECTION I

SURVEY AND DESIGN

Definition - Resource roads are those existing or proposed roads which serve the development of a very limited area (i.e., one or two oil or gas wells) of a depletable natural resource. When the purpose for which the road was constructed no longer requires access, the road will be rehabilitated unless otherwise directed by BLM.

1. Field Survey Requirements

   A. Establish a flag line along the route of construction. The flag line shall be sufficiently marked to insure construction control. Flag intervals shall not exceed 100 feet, or be intervisible, whichever is less.

2. Design Requirements

   All Resource roads constructed by non-government entities across public lands must be designed by or under the direction of a licensed professional engineer. BLM Manual 9113.06 F.

   (A) Design speed, 15 mph.

   (B) Travel way width, minimum 16 feet, maximum 20 feet (exceptions may be made to width requirements if approved by BLM prior to construction).

   (C) Minimum horizontal curve radius, 115 feet (maximum degree of curve 50 degrees unless a shorter radius is approved by BLM prior to construction).

   (D) The road may be outsloped or insloped from 2 - 4 percent on side hill sections where the cross slope is greater than 10 percent but less than 65 percent, the road grade is less than 10 percent and the soil contains over 50 percent rock or gravel. On all other side hill sections, the road shall have an inside ditch.

   (E) Maximum grade, 10 percent (except pitch grades*).

   (F) Turnouts (on roads having a travel surface width of less than 20 feet) shall be located at intervals of 1,000 feet, or within sight distance, whichever is less.

---

* Pitch grades are defined as those grades exceeding 10 percent which are necessary because of topography, i.e., low water crossings. Such grades shall not extend over 300 feet in length, nor shall they be used to circumvent the intent of these stipulations. Maximum pitch grade shall be 16 percent.

(G) Culverts shall be used when they are the only alternative to drainage control.

(H) Drainage control shall be insured over the entire road through the use of natural rolling topography, ditch turn outs, drainage tips, outsloping, or culverts.

(I) The need for aggregate surfacing shall be determined based on the ability of the finished native surface to carry the design loads without surface distortion which would result in excessive soil erosion.

The Company shall submit to the BLM two copies of a road location map prior to beginning construction. The map shall show the location and size of all culverts planned. Review of the road plan will be done by the BLM at or prior to the pre-drill conference.

3. Construction Control

The road shall be constructed along the approved flag line.

THE COMPANY SHALL PROVIDE A COMPETENT ON-SITE INSPECTOR DURING CONSTRUCTION OF THE ROAD TO INSURE COMPLIANCE WITH ALL STIPULATIONS. THE INSPECTOR SHALL BE DESIGNATED AT THE PRE-DRILL CONFERENCE, AND SHALL BE GIVEN AN APROVED COPY OF ALL MAPS AND STIPULATIONS PRIOR TO START OF CONSTRUCTION. THE BLM WILL ALSO DESIGNATE A REPRESENTATIVE FOR THE PROJECT AT THE PRE-DRILL CONFERENCE.

RESOURCE ROADS
(CLASS III ROADS)

SECTION 2

CONSTRUCTION STANDARDS

1. Public Convenience and Safety

The Company shall take all necessary precautions for the protection of the work and safety of the public during construction of the road.

Warning signs shall be posted wherever directed during blasting operations.

2. Clearing and Grubbing

Clearing and grubbing shall be carried out on all sections of the road where side slopes are less than 60%.

All clearing and grubbing shall be confined to the limits of actual construction unless otherwise authorized by the BLM. Branches of trees extending over the roadbed shall be trimmed to give a clear height of 16 feet above the roadbed surface. All perishable material resulting from clearing and grubbing operations shall be disposed of as specified at the pre-drill conference.

3. Excavation

Prior to beginning excavation and fill placement operations, all vegetation or debris within the designated limits of the roadway, except such objects as are designated to remain in place, are to be removed and disposed of as provided in Paragraph #2. All suitable material removed during excavation operation shall be used as far as practicable in the formation of the embankments and for other purposes as directed by the BLM, i.e., topsoil, stockpiling.

4. Embankment Construction

Embankment material shall not be placed when either the materials or the surface on which they will be placed are frozen or too wet (as determined by BLM) for satisfactory compaction. The Contractor shall route his construction equipment over the layers of embankment material already in place to avoid uneven compaction anywhere along the travel route.

Borrow material shall not be used until all of the accessible roadway excavation has been placed in the embankments unless otherwise permitted by the BLM.

Roadside ditches shall conform to the slope, grade and shape of the required cross section, with no projections of roots, stumps, rocks or similar matter. Roadside ditches shall be "V" type ditches excavated to a depth of one foot minimum, below finished road surface. Roadside ditch backslopes shall not be cut flatter than 1½:1. Roadside ditch "turn outs" shall be constructed at intervals not exceeding 500 feet when the cross slope does not exceed 5 percent.

All slopes, shoulders and road surfaces shall be finished smoothly and in accordance with the lines and grades shown on the drawings.

5. Drainage Dip Construction

Drainage dips shall be spaced in accordance with the following table:

Road Grade %	Drainage Dip Spacing in Feet
2	300
4	230
6	200
8	170
10	160

Culvert pipes shall be used for cross drains on grades in excess of 10%.

This table is intended as a guide only and may require adjustment in the field for site-specific conditions.

(A) Construction Requirements

Construction shall be as specified in paragraphs 3 and 4, and as shown on the drawings.

6. Seeding

(A) The Company shall carry out erosion control items of vegetation establishment during the season established for seeding. Vegetation establishment shall be completed on areas of disturbance as they are completed if actual construction is being accomplished during the seeding season.

Seeding shall be carried out on all of the areas described as follows:

(1) On cut slopes, and shall extend from the bottom of the ditch to the top of the cut slope.

(2) On embankment slopes, and shall extend from the roadway shoulder to the toe of the embankment slope.

(3) On all borrow pit areas.

(4) On all "side cast" in areas of full bench construction.

(B) Seeding season shall be from September 15 to December 15, or as otherwise allowed by the BLM.

SECTION 3

ROAD MAINTENANCE STANDARDS

The completed road shall be maintained to the following standards as applicable for the term of use.

1. Travel Way

   (A) Roadbed is smooth, free of ruts, chuckholes, rocks, slides, washboards; crowned and/or sloped for drainage.

   (B) Free from excessive accumulation of dust pockets of layers which are a driving hazard or public nuisance.

   (C) Berms shall be absent along the shoulder.

   (D) Soft spots, such as those resulting from springs and seeps, shall be absent.

2. Shoulders

   (A) Shoulders are straight and present a uniform line with the surface free from large rocks, limbs, or stumps.

3. Ditches and Drainage Dips

   (A) Original cross section shall be maintained. Drainage area clear of rocks, slides and sediments.

   (B) Vegetation or sedimentation does not restrict ditch flow or reduce the waterway area.

   (C) Ditch bottom is stable and is not excessively eroded.

   (D) Back slope area above ditches is stable.

4. Other Related Road Features

   (A) Right-of-way free of excessive or objectional litter.

5. Fences, Gates and Cattleguards

   (A) Posts are sound, plumb and secure.

   (B) Wire is tight and securely fastened to the posts.

   (C) Stays are uniformly spaced and vertical between posts and affixed to keep the strands properly spaced.

   (D) Rock deadmen are properly secured to the fence.

(E) Gates are free from deterioration, damage to structural sections or loose hardware.

(F) Cattleguard pits are clean and functional. End wings securely fastened and serviceable. Guard and base in serviceable condition.

6. <u>Fords and Low Crossings</u>

(A) There is a smooth transition between road and ford.

(B) No excessive erosion adjacent to the structure.

(C) The surface of the structure is clear of debris, brush, rocks and sediment.

(D) Bottom of crossing is level with stream bottom.

7. <u>Safety and Hazard Control</u>

(A) Sight distance free of shrubs, trees and obstacles and meets design standards.

(B) Travel way and ditches free of overhanging trees and limbs. No down trees or branches in ditch area.

(C) No unstable material above the roadway.

SECTION 4

ROAD RECLAMATION STANDARDS

1. Natural contours will be restored wherever practical. Roads with significant cuts will have fill material placed back onto cut sections using care not to mix topsoils with base material.

2. All road surfaces shall be ripped, scarified, or otherwise roughened as directed by BLM to insure increased water infiltration and a properly prepared seed bed.

3. All road berms will be removed and recontoured.

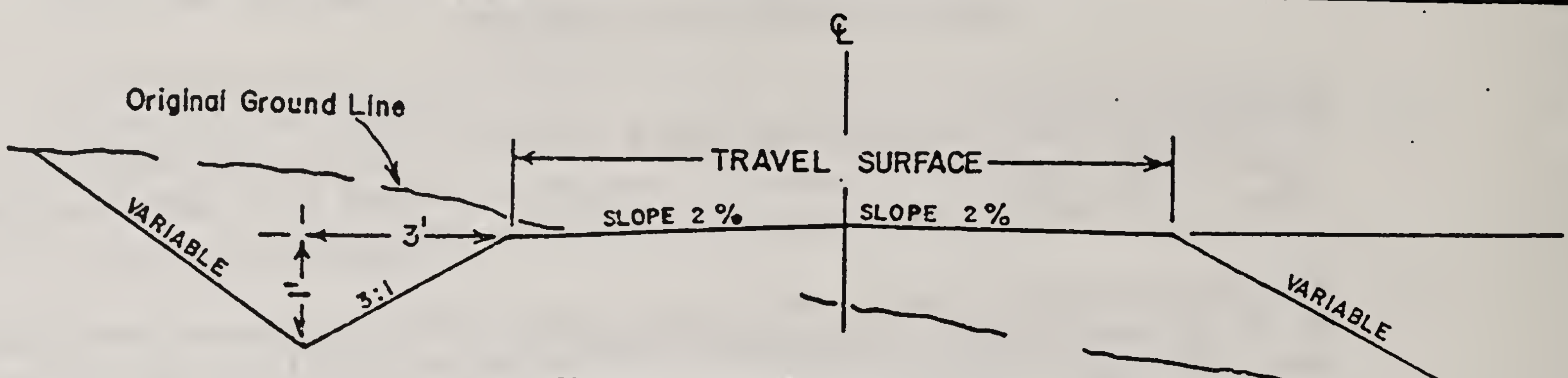
4. Waterbars will be used on all sloping surfaces as shown below:

Grade	Spacing
2%	200 ft. spacing
2-4%	100 ft. spacing
4-5%	75 ft. spacing
+5%	50 ft. spacing

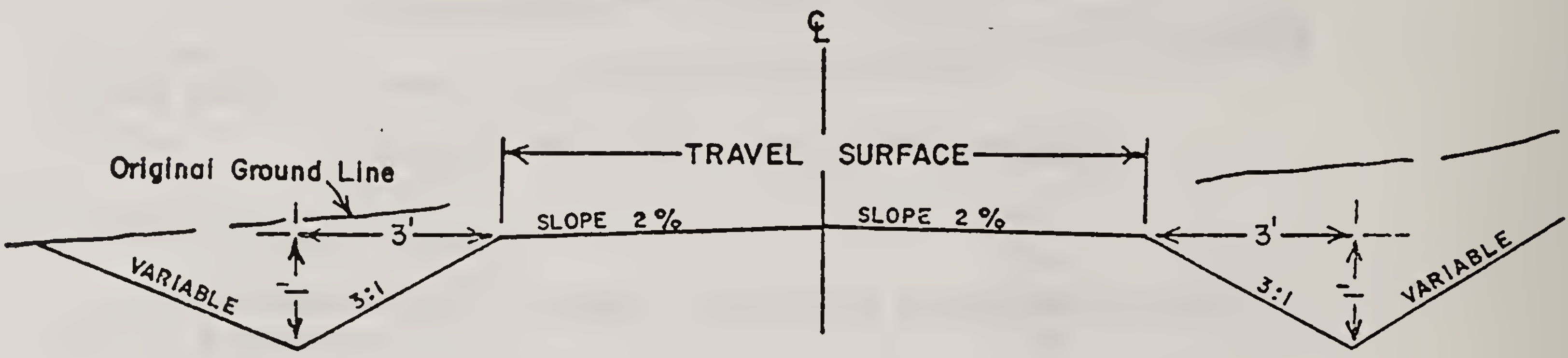
5. Rehabilitated areas will be seeded as follows:

Species	Rate *
-	

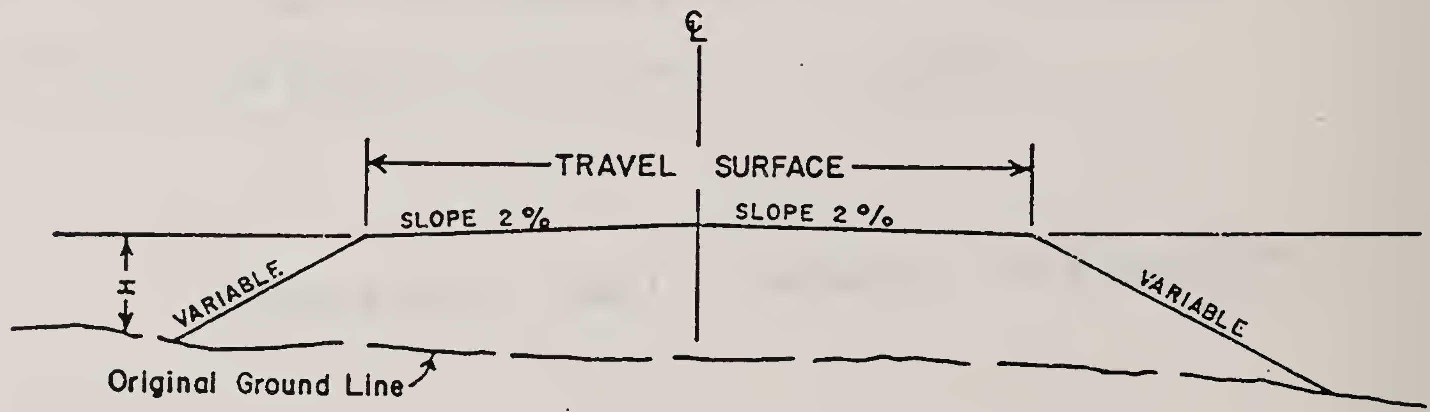
* These rates will increase 2.5 times if broadcasted.



TYPICAL SIDE HILL SECTION



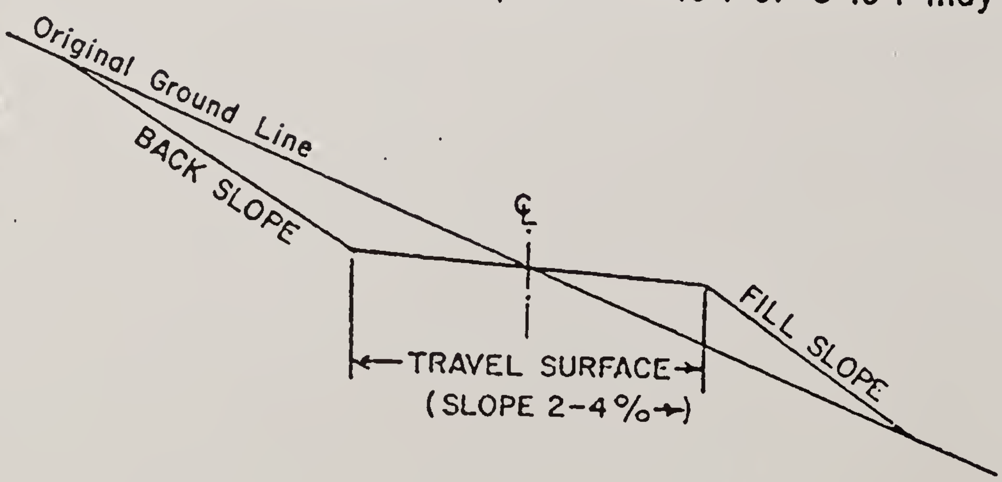
TYPICAL FULL CUT SECTION



TYPICAL EMBANKMENT SECTION

Soil Conditions	Natural Ground Slope	Back Slope
Normal Soil	0 – 30 %	1 1/2 : 1
Normal Soil	30 – 55 %	1 : 1
Normal Soil	55 % and over	3/4 : 1
Solid Rock	All Slopes	1/4 : 1

When the cuts are relatively shallow (under 4 feet), flatter slopes of 2 to 1 or 3 to 1 may be used.



TYPICAL OUTSLOPED SECTION

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

TYPICAL ROAD SECTIONS
(Class III)

DESIGNED R.A.D.	RECOMM.
DRAWN J.H.S.	RECOMM. Robert A. Dullar
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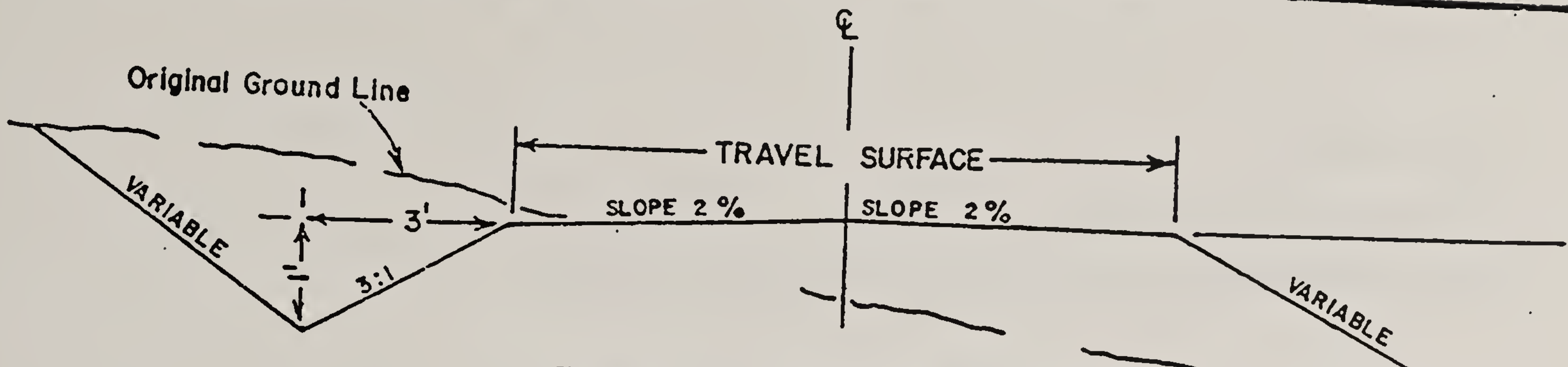

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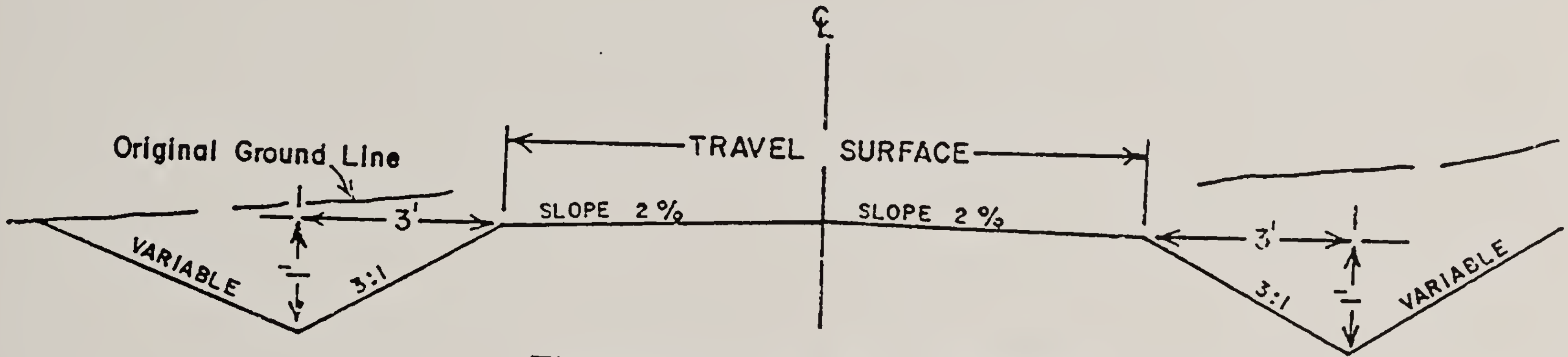

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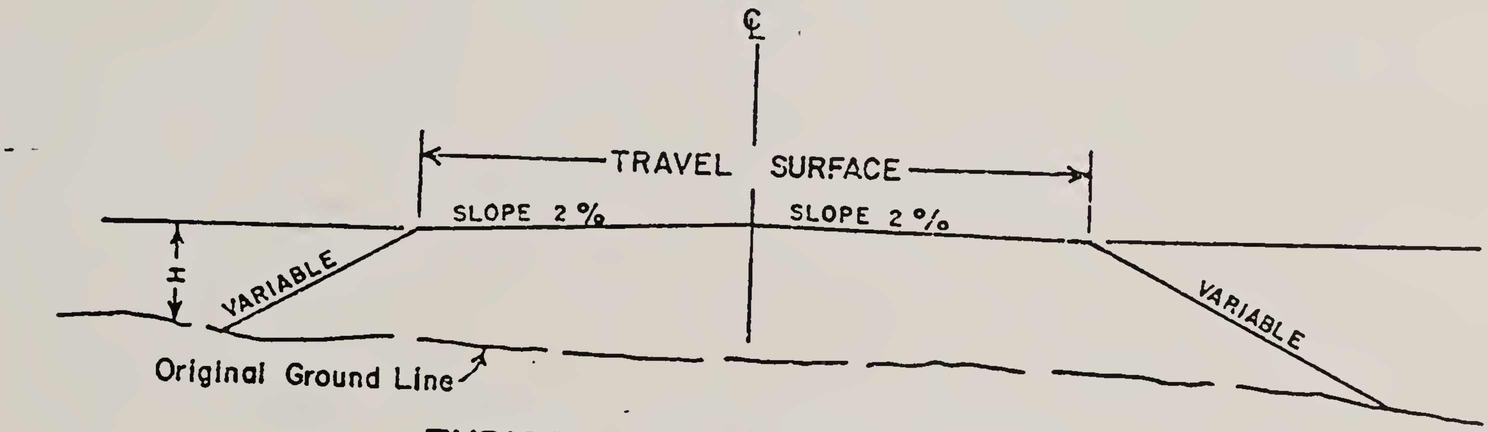

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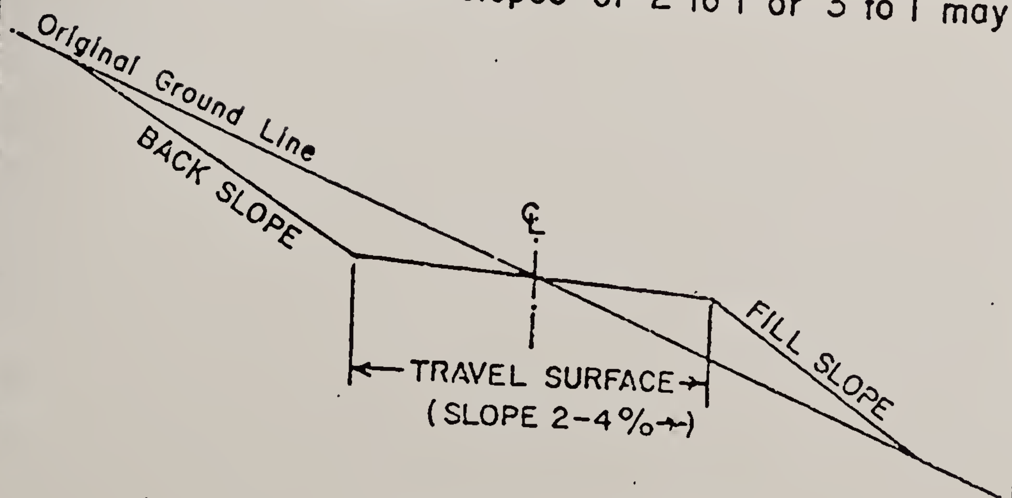

TYPICAL OUTSLOPED SECTION

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

TYPICAL ROAD SECTIONS
(Class III)

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CHECKED RAD	APPROVED Colin [illegible]

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DRAWING NO.

APPENDIX 2D
BLM SURFACE USE AND OPERATIONS PLAN AND TYPICAL DRILLING PLAN

RIVER GAS CORPORATION
Price Coalbed Methane Project
Townships 13 to 16 South, Ranges 8 to 11 East
Carbon and Emery Counties, Utah

Typical Multi-Point Surface Use and Operations Plan

1. Existing Roads: Refer to Map "A"

A. The proposed well site is staked and two 200-foot reference stakes are present.
B. The project area is located immediately west and is inclusive of the City of Price, Utah.
C. Access roads - refer to Maps "A" and "B".
D. Access roads within a one (1) mile radius - refer to Map "B".
E. The existing roads will be maintained in the same or better condition as existed prior to the commencement of operations and said maintenance will continue until final abandonment and reclamation of the well location.

2. Planned Access Roads: Refer to Map "B"

Approximately ____ feet of new road construction will be required for access to the proposed __________________ well location.

A. Width - maximum 48-foot overall right-of-way with a maximum 24-foot road running surface, crowned & ditched.

B. Construction standard - the access road will be constructed in accordance with Bureau of Land Management Roading Guidelines established for oil and gas exploration and development activities as referenced in the BLM/USFS publication: Surface Operating Standards for Oil and Gas Exploration and Development, Third Edition, and/or Bureau of Land Management Manual Section 9113 on road construction.

The access road will be constructed to meet the standards of the anticipated traffic flow and all-weather requirements.

Construction will include ditching, draining, graveling, crowning, and capping the roadbed as necessary, or required, to provide a well constructed and safe road.

Prior to construction/upgrading, the roadway shall be cleared of any snow cover and allowed to dry completely.

A minimum of six (6) inches of topsoil will be stripped from the new construction portion of the access road route prior to performing any further construction activities thereon. During construction, the access road will be compacted as necessary to ensure a stable road base.

Traveling off of the thirty (48) foot right-of-way will not be allowed.

Upgrading shall not be allowed during muddy conditions.

Should mud holes develop, they shall be filled in and detours around them avoided.

C. Maximum grade - 10% or less.

D. Turnouts - traffic turnouts will be constructed along the access route according to Bureau of Land Management Roading Guidelines referenced in Item #2B, above.

E. Drainage design - the access road will be crowned, ditched, and water turnouts installed as necessary to provide for proper drainage along the access road route.

F. Culverts, cuts and fills - culverts will be installed as required to provide for proper drainage along the access road route. These culverts will be of both sufficient size and carrying capacity (18 inch minimum diameter) to allow for the free flow of water along the access road route.

These culverts will be installed in accordance with Bureau of Land Management Roading Guidelines referenced in Item #2B, above.

G. Gates, cattleguards or fence cuts -.cattleguards .will be installed along the access road route as required for access through existing fences.

Prior to installation of these cattleguard(s), the existing fence(s) will be "H" braced on either side in order to maintain the structural integrity of the fence. Cattleguards will be maintained as necessary to ensure their functionality.

In addition to these cattleguards, metal gates will be installed as required by the private surface owner(s) to prevent unauthorized access to the private lands beyond.

H. Surface materials - any construction materials which may be required for surfacing of the access road will be purchased from a local contractor having a permitted source of materials (gravel) in the area.

I. Road maintenance - during both the drilling and production phase of operations, the road surface and shoulders will be kept in a safe and useable condition and will be maintained in accordance with the original construction standards.

All drainage ditches and culverts will be kept clear and free-flowing, and will also be maintained in accordance with the original construction standards.

The access road right-of-way will be kept free of trash during operations.

J. The proposed road route will be centerline staked prior to the commencement of construction activities.

3. Location of Existing Wells Within a One-Mile Radius:

NOTE: Site specific information will be inserted for "Producing Wells" as appropriate.

A. Water wells - none known.
B. Abandoned wells - none known.
C. Temporarily abandoned wells - none known.
D. Disposal wells - none known.
E. Drilling wells - none known.
F. Producing wells - none known.
G. Shut-in wells - none known.
H. Injection wells - none known.
I. Monitoring wells - none known.

4. Location of Existing and/or Proposed Facilities Owned By River Gas Corporation Within a One-Mile Radius:

A. Existing

NOTE: Site specific information will be inserted as appropriate.

1. Tank batteries - none.
2. Production facilities - none.
3. oil gathering lines - none.
4. Gas gathering lines - none.

B. New Facilities Contemplated

1. All production facilities will be located on the disturbed portion of the well pad and at a minimum of twenty (20) feet from the toe of the backcut or top of the fill slope.

2. Production facilities will require an area approximately 2501 X 1251. A diagram showing the proposed production facility layout will be submitted to the Authorized officer via Sundry Notice (Form 3160-5) for approval prior to commencement of 'Installation operations.

3. Production facilities will be accommodated on the well pad. Construction materials needed for installation of the production facilities will be obtained from the site; any additional materials which may be needed will be purchased from a local supplier as required.

A dike will be constructed completely around any production facilities containing liquid hydrocarbons (i.e., production tanks, produced water tanks and/or separator). These dikes will be constructed of compacted subsoil, be impervious, hold 1.5 times the capacity of the largest tank, and be independent of the back cut.

4. All permanent above-the-ground structures, tank batteries, etc. that will remain longer than six months will be painted Carlsbad Canyon (Munsell standard color 2.5Y 6/2). The exception being that Occupation Health and Safety Act Rules and Regulations will be complied with where special safety colors are required.

C. The production pit will be fenced sheep-tight with woven wire mesh topped with two (2) strands of barbed wire held in place by side posts and wooden corner "H" braces in order to protect livestock and wildlife. Please refer to Item #10D (page #9) for additional information regarding these fencing specifications.

D. During drilling and subsequent operations, all equipment and vehicles will be confined to the access road and any additional areas specified in the approved Application for Permit to Drill.

E. Reclamation of disturbed areas no longer needed for operations will be accomplished by grading, leveling and seeding as recommended by the Authorized Officer, Bureau of Land Management.

5. <u>Location and Type of Water Supply:</u>

The proposed action would require certain amounts of water for well stimulation, dust control and possibly drilling (as discussed above, drilling mud may be required to handle certain downhole problems). River Gas has entered into an agreement with the Price River Water Improvement District ("PRWID") to purchase fresh water. River Gas has installed a buried pipeline from the Carbon County Fairgrounds to the existing development that carries fresh water from PRWID.

Where economics or water availability requires, the proposed action may include the purchase of fresh water from individuals in the area.

River Gas plans to file for all rights to water produced during development of the Proposed Action. If an economical and commercially available water treatment technique is found, River Gas plans to provide the water for beneficial use.

6. <u>Source of Construction Materials:</u>

A. No construction materials will be needed for well pad construction; surface and sub-surface soils will be sufficient. Refer to Item #2H (page #3) for additional information regarding any construction materials which may be required on the access road.

B. No construction materials will be taken from Federal and/or Indian lands without prior approval from the appropriate Surface Management Agency.

C. If production is established, any construction materials required for surfacing of the access road and installation of production facilities will be purchased from a local supplier having a previously approved (permitted) source of materials in the area.

D. No new access roads for construction materials will be required.

7. Methods of Handling Waste Materials:

A. Cuttings - the cuttings will be deposited in the reserve pit.

B. Drilling fluids - including salts and chemicals will be contained in the reserve pit and allowed to evaporate.

The reserve pit will be designed to prevent the collection of surface runoff and will be constructed with a minimum of one-half (1/2) the total depth below the original ground level at the lowest point in the pit.

C. Produced fluids - liquid hydrocarbons produced during completion operations (none anticipated) will be placed in test tanks on the location. Water produced during completion operations will be put into the reserve pit according to the provisions of Notice to Lessees 2-B (NTL-2B).

Produced fluids - any spills of potentially hazardous materials will be cleaned up and immediately removed to an approved waste disposal site.

D. Sewage - portable, self-contained chemical toilets will be provided for human waste disposal. The toilet holding tanks will be pumped as necessary,, and the contents thereof disposed of at an approved sewage disposal facility.

E. Garbage and other waste material - garbage, trash and other waste materials will be collected in a portable, self-contained and fully-enclosed trash cage during drilling and completion operations.

Upon completion of operations (or as needed) the accumulated trash will be disposed of at an authorized sanitary landfill. No trash will be placed in the reserve pit.

F. Immediately after removal of the drilling rig, all debris and waste materials not contained in the trash cage will be cleaned up and removed from the well location. No adverse materials will be left on the location. Any open pits will be fenced during drilling operations and the fencing will be maintained until such time as the pits are backfilled.

8. Ancillary Facilities:

None anticipated.

9. Wellsite Layout:

NOTE: Figures are prepared on a site specific basis and will be included in each individual Application for Permit to Drill (APD) according to the requirements of onshore Operating Order #1.

A. Figure #1 shows the drill site layout as staked. Cross sections have been drafted to visualize the planned cuts-and fills across the location. A minimum of six (6) inches of topsoil will be stripped from the location (including areas of cut, fill, and/or subsoil storage) and stockpiled for future reclamation of the well site.

9. Wellsite Layout: Continued

A. Refer to Figure #1 for the location of the topsoil stockpiles.

B. Figure #1 is a diagram showing the rig layout. No permanent living facilities are planned. There will be three trailers on location: one each for the geologist, mud logger, and toolpusher.

C. A diagram showing the proposed production facility layout will be submitted to the Authorized officer via Sundry Notice (Form 3160-5) for approval prior to the commencement of installation operations. Please refer to Item #4B2 (page #4) for additional information in this regard.

D. We do not anticipate the need for a reserve pit liner at this time. However, if porous subsoil materials (i.e., gravel, sand, fractured rock structures, etc.) are encountered during the course of reserve pit construction, an impervious liner will be installed in order to prevent drilling water loss through seepage.

10. Plans for Reclamation of the Surface:

A. Backfilling, leveling and re-contouring are planned as soon as the reserve pit has dried. All waste materials will be disposed of immediately upon termination of drilling and completion activities.

If production is established, the unneeded areas of the location will be reclaimed as soon as the reserve pit has dried. For production, the fill slopes will be reduced from a 1.5:1 slope to a 3:1 slope and the cut slopes will be reduced from a 2:1 slope to a 3:1 slope by pushing the fill material back up into the cut.

B. Upon completion of backfilling, leveling and recontouring, all disturbed surfaces (including the access road and well pad areas) will be scarified (ripped) and the stockpiled topsoil will be evenly spread over the reclaimed area(s). The seedbed will be prepared by disking on the contour to an approximate depth of four (4) to six (6) inches, leaving no depressions that would trap water or form ponds.

C. All disturbed surfaces (including the access road and well pad areas) will be reseeded using a seed mixture to be recommended by the Authorized officer, Bureau of Land Management.

Seed will be drilled on the contour (or at right angles to the prevailing wind on level areas) with the seed drill set at a depth of one-half inch.

Fall seeding will be completed after September 1 and prior to ground frost. Spring seeding, to be effective, will be completed after the frost has left the ground and prior to June 1.

D. Three sides of the reserve pit will be fenced during drilling operations and the fourth side will be fenced immediately upon rig removal. Said fencing will consist of woven wire mesh with two (2) top strands of barbed wire held in place with side posts and wooden corner "H" braces in order to protect livestock and wildlife.

E. If any oil is on the pits and is not immediately removed after operations cease, the pit containing the oil or other adverse substance(s) will be flagged overhead or covered with wire mesh in order to protect migrating shorebirds and waterfowl.

F. Reclamation operations will begin after the drilling rig has been removed. Removal of oil or other adverse substances will begin immediately or the affected area(s) will be flagged and/or fenced. other clean-up will be done as needed. Re-seeding activities are considered best in the Fall, 1992, unless requested otherwise.

11. Surface Owners:

The proposed access road route and well location are situated on surface estate owned and administered by:

Name
Address
City, State, Zip Code
Telephone Number

NOTE: If private surface, the following statement will be inserted as required by onshore Operating order #1.

I hereby certify that River Gas Corporation will enter into "good faith" negotiations with the affected surface owner(s) in an attempt to reach an equitable agreement with said party as to the requirements for the protection of surface resources and reclamation of disturbed areas and/or damages in lieu thereof.

In the event an equitable agreement can not be reached with said surface owner(s), River Gas Corporation will comply with the provisions of the law and/or applicable regulations governing the Federal or Indian right of re-entry to the surface (43 CFR 3814).

Date ____________________ Authorized Signature ____________________

12. <u>Other Information:</u>

A. General Description of the Project Area:

B. Surface Use Activities: The primary surface use is for grazing.

C. Proximity of Water, Occupied Dwellings, Archaeological, Historical or Cultural Sites:

1. The closest source of permanent water is:

2. The closest occupied dwellings are located in:

3. If historic or archaeological materials are uncovered, River Gas Corporation will suspend all operations that might further disturb such materials and immediately contact the Authorized officer.

Within five (5) working days the Authorized officer will inform River Gas Corporation as to:

- whether the materials appear eligible for the National Register of Historic Places;

3. Within five (5) working days the Authorized officer will inform River Gas Corporation as to: continued

- the mitigation measures the operator will likely have to undertake before the site can be used (assuming in situ preservation is not necessary); and

- a time frame for the Authorized Officer to complete an expedited review under 36 CFR 800.11 to confirm, through the State Historic Preservation officer, that the findings of the Authorized Officer are correct and that mitigation is appropriate.

If River Gas Corporation wishes, at any time, to relocate activities to avoid the expense of mitigation and/or the delays associated with this process, the Authorized Officer will assume responsibility for whatever recordation and stabilization of the exposed materials may be required. otherwise, River Gas Corporation will be responsible for mitigation costs.

The Authorized Officer will provide technical and procedural guidelines for the conduct of mitigation. Upon verification from the Authorized officer that the required mitigation has been completed, River Gas Corporation will then be allowed to resume construction.

13. Lessee's or Operator's Representative and Certification:

Representative

River Gas Corporation
Randy Allen, General Counsel
Energy Center Blvd.
Northport, Alabama 35476
Phone: (205) 759-3282

Certification

All lease and/or unit operations will be conducted in such a manner that full compliance is made with all applicable laws, regulations, Onshore Oil & Gas Orders, the approved plan of operations, and any applicable Notice to Lessees.

River Gas Corporation will be fully responsible for the actions of their subcontractors. A copy of these conditions will be furnished to the field representative(s) to ensure compliance.

The dirt contractor will be provided with a copy of the Surface Use Plan from the approved Application for Permit to Drill.

I hereby certify that I, or persons under my direct supervision, have inspected the proposed drill site and access road route; that I am familiar with the conditions which currently exist; that the statements made in this plan are, to the best of my knowledge, true and correct; and that the work associated with the operations proposed herein will be performed by River Gas Corporation, their contractors and subcontractors in conformity with this plan and the terms and conditions under which it is approved. This statement is subject to the provisions of 18 U.S.C. 1001 for the filing of a false statement.

________________ ____________________________
Date Authorized Signature

RIVER GAS CORPORATION
PRICE COALBED METHANE PROJECT

TYPICAL DRILLING PROGRAM

Attached to Form 3
River Gas Corporation
#19-150 Telonis
NE/4 NW/4 Sec. 19, T14S, R9E
751' FNL & 1940' FWL
Carbon County, Utah

1. The Geologic Surface Formation

Upper Mancos Shale

2. Estimated Tops of Important Geologic Markers

Blue Gate/Ferron	2830'
Ferron/Tununk	3116'

3. Projected Gas and H2O Zones (Ferron Formation)

Coals and sandstones - 2826' to 2996'

No groundwater is expected to be encountered.

Casing and cementing will be done to protect potentially productive hydrocarbons, lost circulation zones, abnormal pressure zones, and prospectively valuable minerals deposits. All indications of usable water will be reported.

Surface casing will be tested to 2000 psi.

4. The Proposed Casing and Cementing Programs

Hole Size	Setting Depth (Interval)	Section Length	Size (OD)	Weight, Grade & Joint	New, Used
11	300'	300'	8 5/8	24#	new
7 7/8	3216'	3216'	5 1/2	17#	new

Cement Program

Surface Casing:	110 sx Class G, 15.8 ppg cement
Production Casing:	50/50 Pozmix and tail in with RFC. The 50/50 Pozmix accounts for 75% total cement, RFC 25%. Total sx cement 361. Cement volumes will vary depending on formations encountered and hole conditions.

The following shall be entered in the driller's log:

(1) Blowout preventer pressure tests, including test pressures and results;

(2) Blowout preventer tests for proper functioning;

(3) Blowout prevention drills conducted;

(4) Casing run, including size, grade, weight, and depth set;

(5) How the pipe was cemented, including amount of cement, type, whether cement circulated, location of the cementing tools, etc.;

(6) Waiting on cement time for each casing string;

(7) Casing pressure tests after cementing, including test pressures and results.

5. The Operator's Minimum Specifications for Pressure Control

EXHIBIT "C" is a schematic diagram of the blowout preventer equipment. A double gate 2000 psi BOPE will be used with a rotating head. This equipment will be tested to 2000 psi. All tests will be recorded in a Driller's Report Book. Physical operation of BOPs will be checked on each trip. A BOP test company will be used to do all BOP testing.

6. The Type and Characteristics of the Proposed Circulating Muds

0-300	11" hole	Drill with air, will mud-up if necessary
300-3246	7 7/8" hole	Drill with air. 400 psi at 1500-1800 Scf.

7. The Testing, Logging and Coring Programs to be Followed

0-300	Gamma Ray
300-TD	Gamma Ray, Density, Neutron Porosity, Induction, Caliper

Any Anticipated Abnormal Pressures or Temperatures

No abnormal pressures or temperatures have been noted or reported in wells drilled in the area nor at the depths anticipated in this well. Bottom hole pressure expected is 850 psi maximum.

No hydrogen sulfide or other hazardous gases or fluids have been found, reported or are known to exist at these depths in the area.

8. Anticipated Starting Date and Duration of the Operations

The well will be drilled in April 1996.

Verbal and/or written notifications listed below shall be submitted in accordance with instructions from the Division of Oil, Gas & Mining:

(a) prior to beginning construction;

(b) prior to spudding;

(c) prior to running any casing or BOP tests;

(d) prior to plugging the well, for verbal plugging instructions.

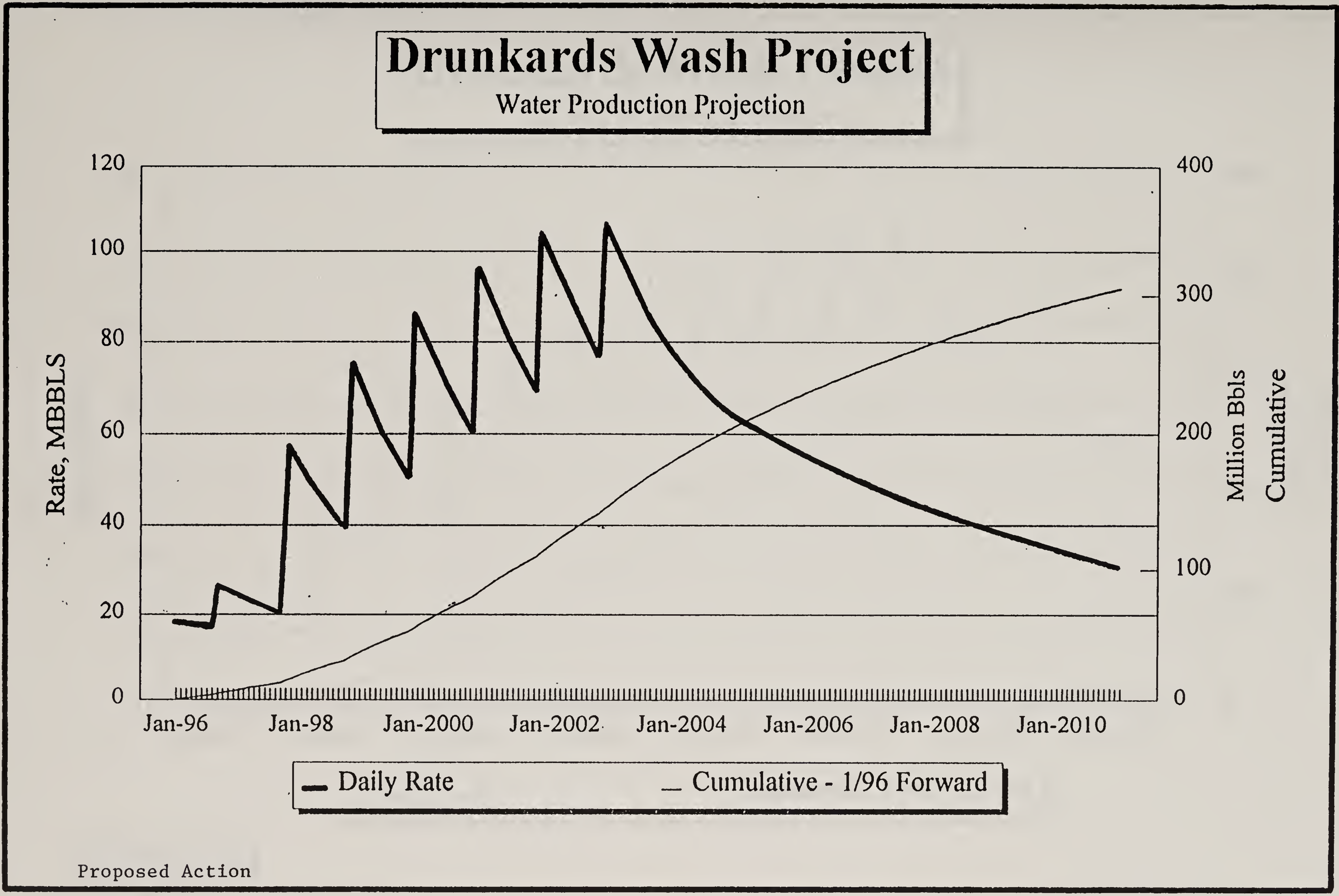
Spills, blowouts, fires, leaks, accidents or other unusual occurrences shall be reported to the Division of Oil, Gas & Mining immediately.

APPENDIX 2E
WATER PRODUCTION PROJECTION PLOTS

The following plots were developed by River Gas to forecast the water production rates for the Proposed Action and each alternative. The methodology used is referred to as zero-time plotting and is based on the water production history of 71 existing CBM well that is extrapolated forward under each of the expanded production scenarios. Zero-time plotting is an accepted approach to project future water production from CBM wells. Individual wells will deviate from the projection, but the averages have typically been found to stay within an acceptable range of the projection. The following is a description of the methodology.

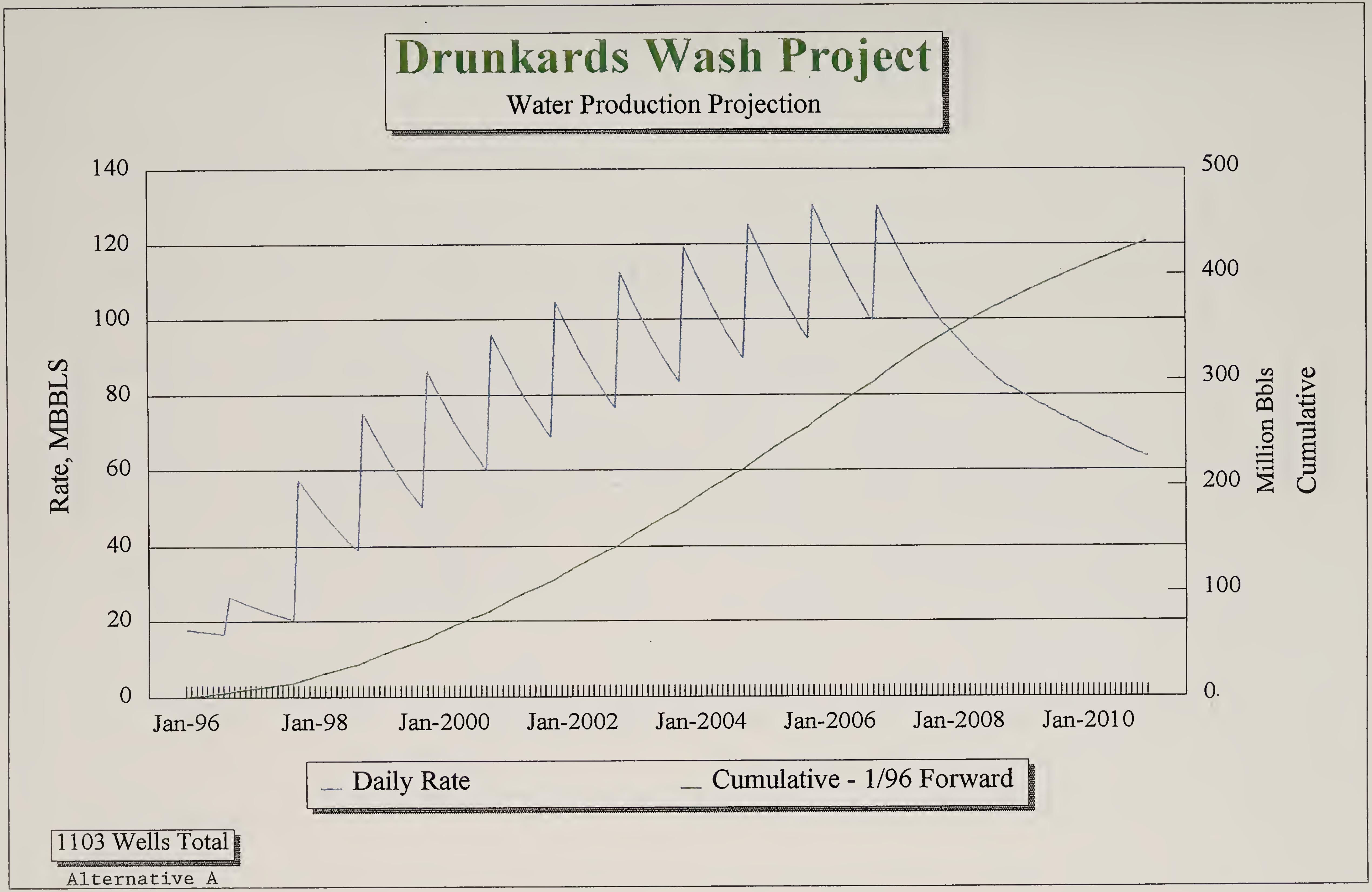
An average daily production rate for all the wells is derived from the monthly production histories of the existing wells. This daily average then becomes the first month's estimated production for the future wells. This process is then repeated for every month of the project with the production from the new wells (typically 100 new wells per year) being superimposed on the forecasted production rates of those already in place. Monitoring has shown peak water production to occur shortly after the well is brought on line, after which it declines rapidly before reaching a semi-constant state. The initial peak production of each well is also observed to decrease in magnitude as a function of the number of wells that are already producing. The zero-time plotting simulates this effect by proportionally reducing the initial maximum production rate for each well as the total number of wells in place increases.

From this process the point at which peak total production is reached and the approximate volume of that peak can be estimated. Quantification of the peak production rate is important so as to be able to adequately size the water disposal facilities and construct them in an appropriate time frame. The zero-time plotting also allows calculation of the cumulative amount of water that would be produced at any point within the project life. This information is used to assess impacts that may be associated with the withdrawal of water from the coals.

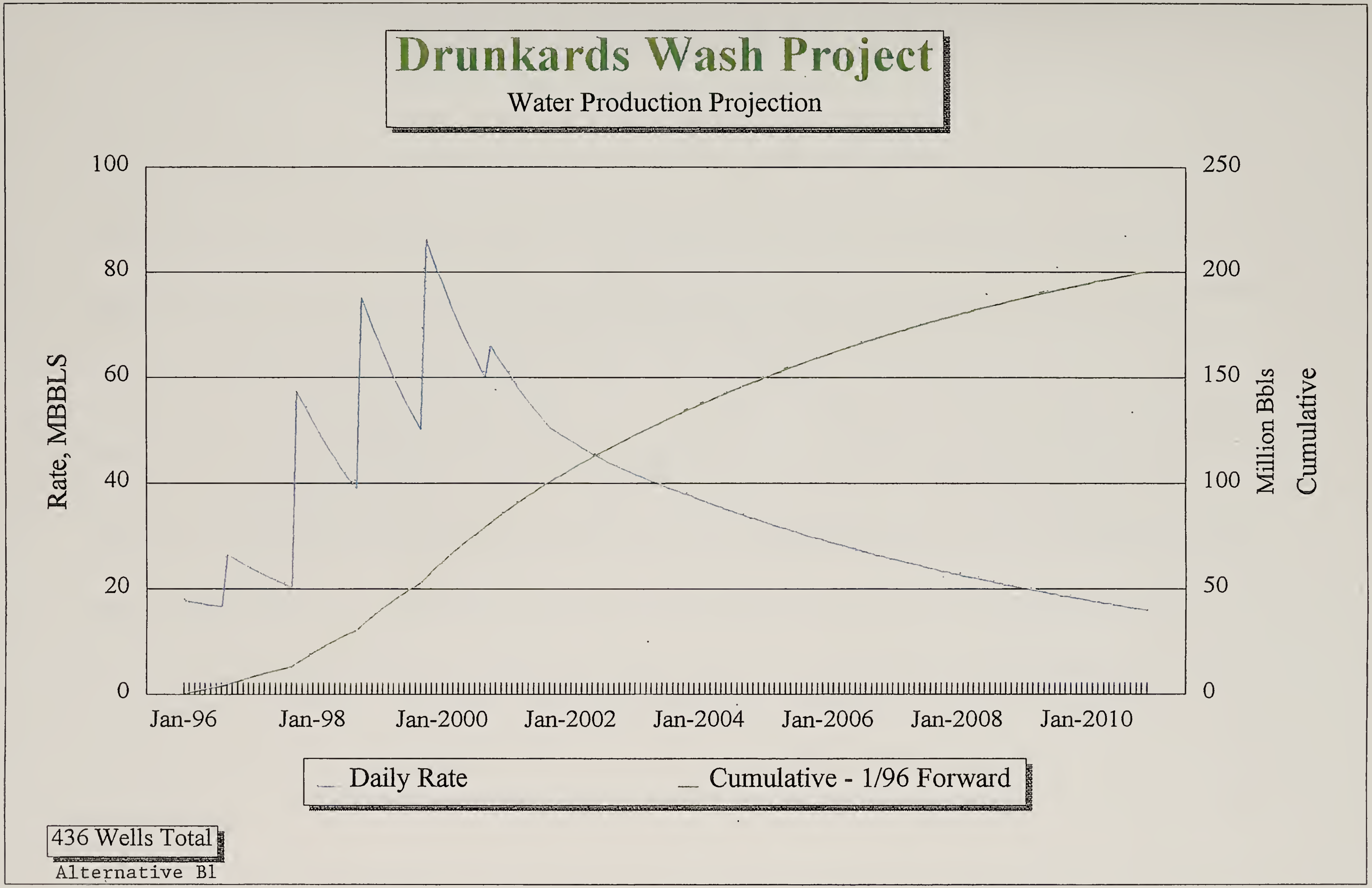


Incremental Wells: 100

06/17/96



Incremental Wells: 100



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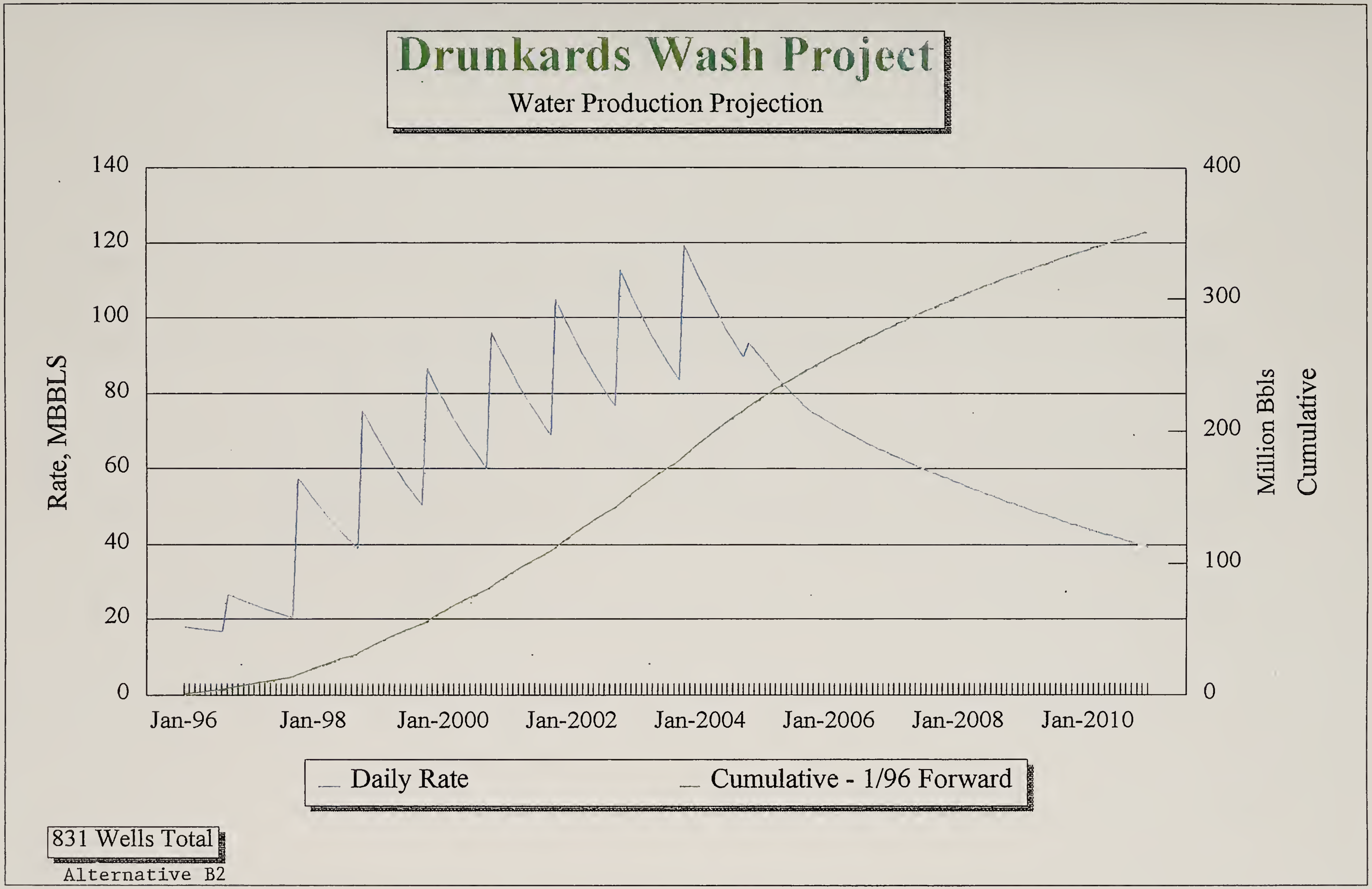

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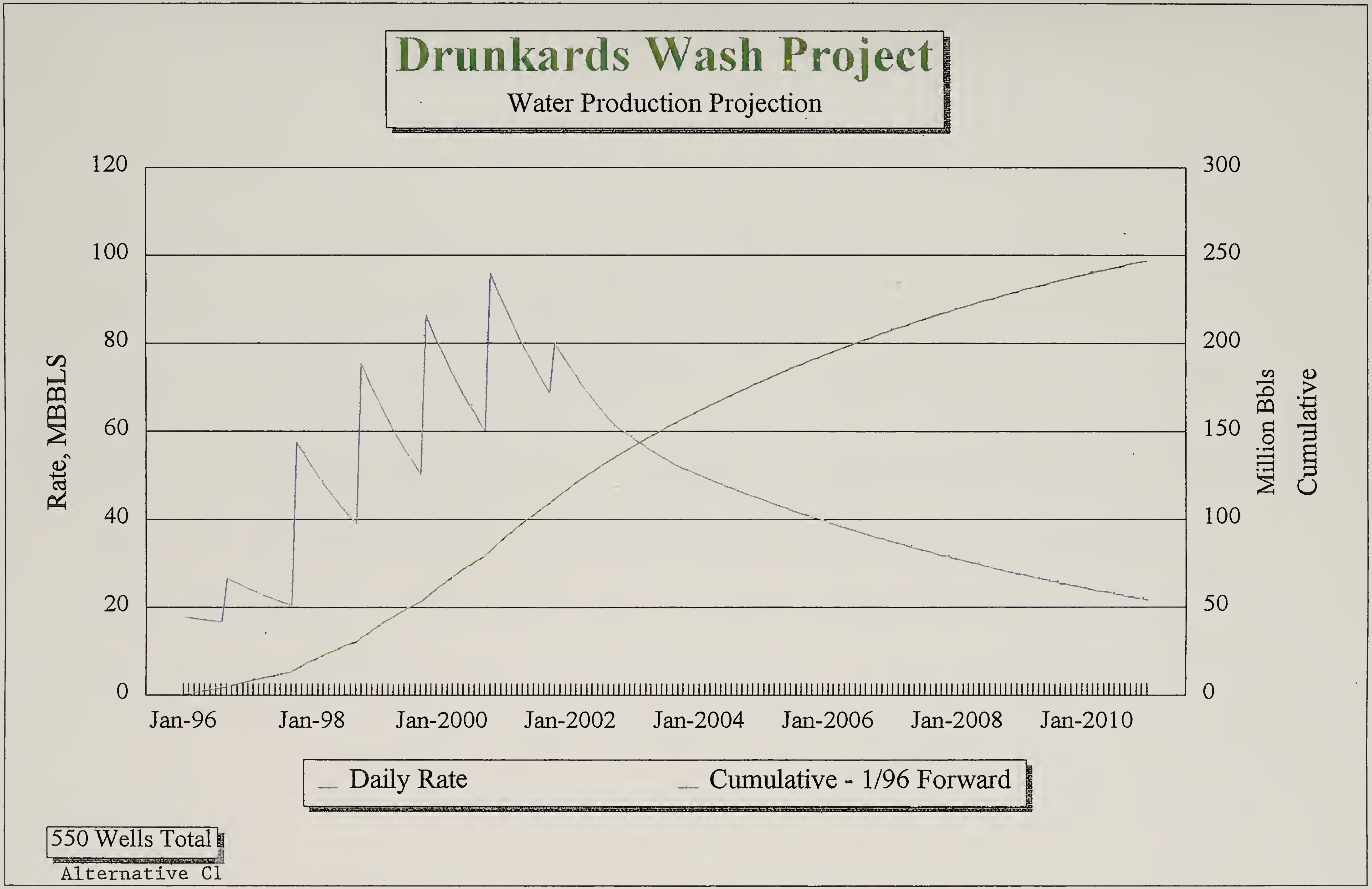
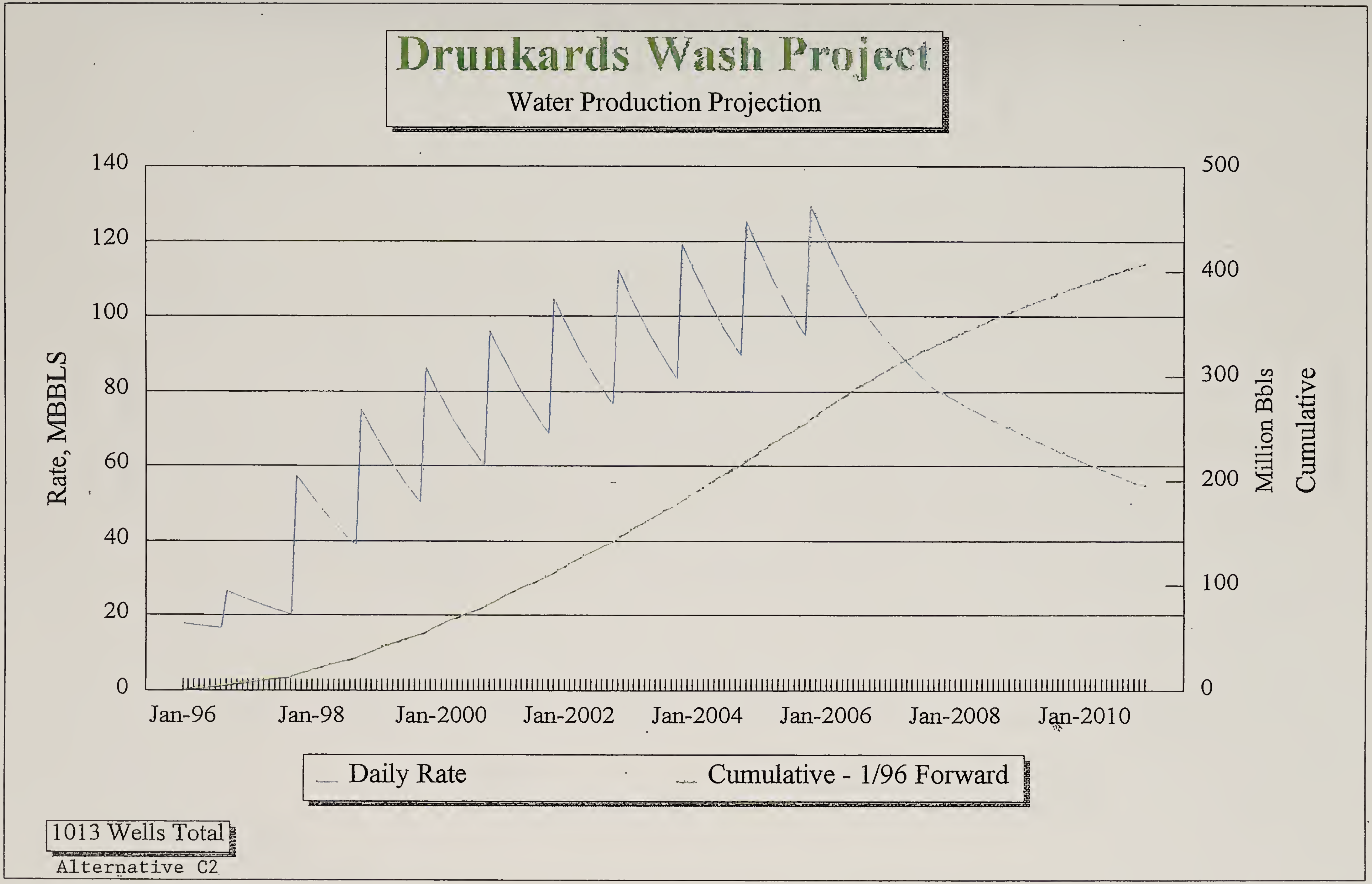
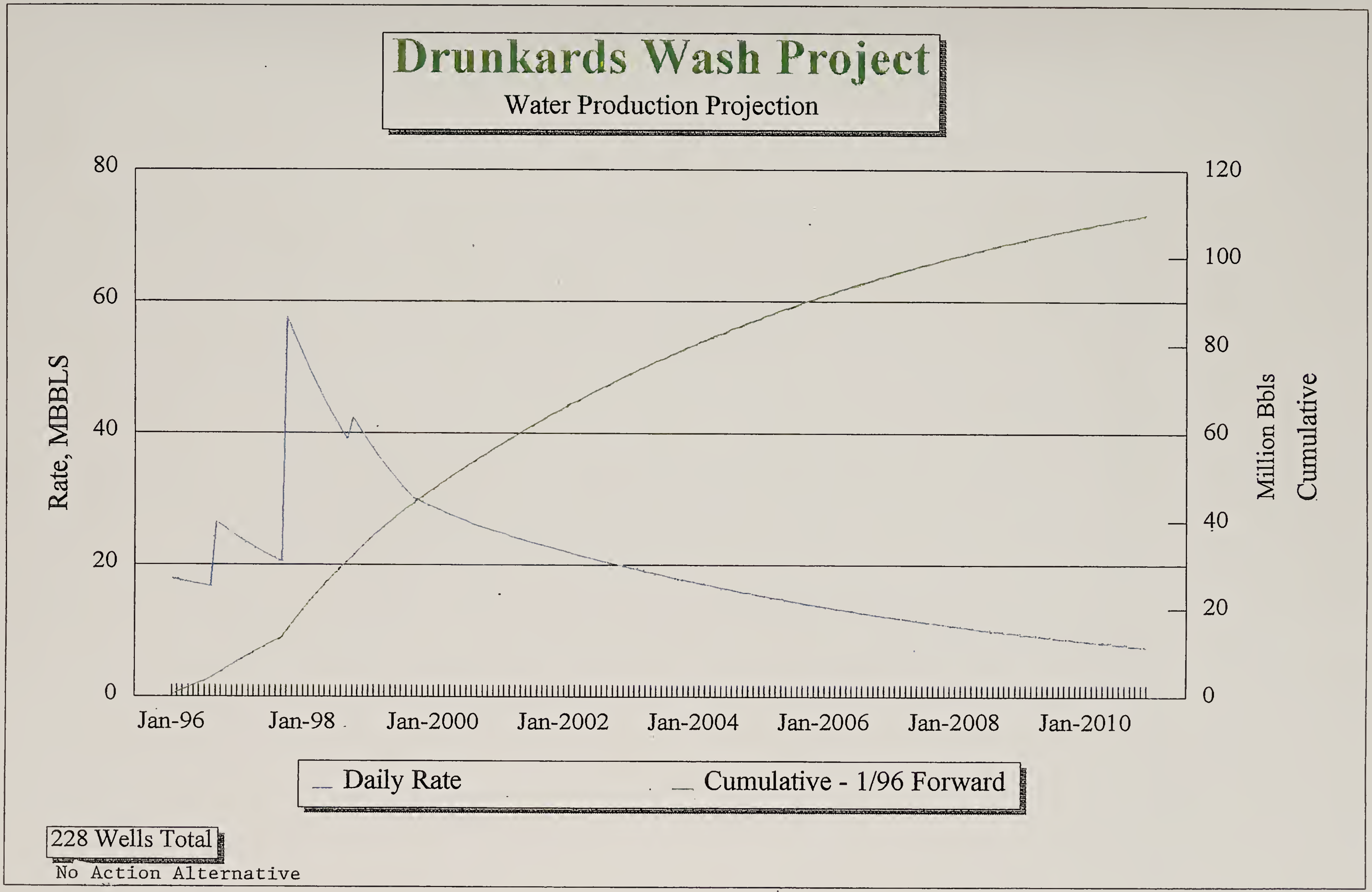


Incremental Wells: 100



Incremental Wells: 100

/17/96



Incremental Wells: 100

APPENDIX 2F

BLM SEED MIXTURES FOR THE PRICE COALBED METHANE PROJECT

Seed mixtures have been developed for general land types throughout the project area. They are based on erosion control, forage production, elevation, soils, vegetation communities and average annual precipitation zones. The mixtures show the plant species and the pounds per acre of pure live seed (PLS) to be planted.

The following seed mixture will be planted along service road borrow ditches, around the edge of drill pads with a production well, and surrounding other production and maintenance facilities. The purpose for this seeding is to provide a "green strip" buffer to minimize fire hazards and prevent invasion and establishment of noxious weeds in areas that will receive continued disturbance for the life of these project areas.

Common Plant Name	Scientific Name	Pounds per acre / PLS*
Forage kochia	Kochia prostrata	2
Wyoming big sagebrush	Artemisia tridentata wyomingensis var. Gordon Creek	1
Douglas low rabbitbrush	Chrysothamnus viscidiflorus	1
	Total	4

The following seed mixtures are for areas that will receive final reclamation. Areas would be planted to protect them from soil erosion and to restore forage production.

Common Plant Name	Scientific Name	Pounds per acre / PLS*
Salt Desert Areas		
Grasses		
Indian ricegrass	Oryzopsis hymenoides	2
Squirreltail	Elymus elymoides	2
Galleta	Hilaria jamesii	2
Forbs		
Lewis flax	Linum perenne lewisii	1
Palmer penstemon	Penstemon palmerii	1
Gooseberryleaf globemallow	Sphaeralcea grossulariifolia	0.5
Shrubs		
Forage kochia	Kochia prostrata	2
Rubber rabbitbrush	Chrysothamnus nauseosus	1
Fourwing saltbush	Atriplex canescens	2
Winterfat	Krascheninnikovia (Eurotia) lanata	2
	Total	15.5

Common Name	Scientific Name	Pounds per acre / PLS*
Sagebrush/Grass Areas		
Grasses		
Indian ricegrass	Oryzopsis hymenoides	2
Squirreltail	Elymus elymoides	2
Thickspike wheatgrass	Elymus lanceolatus	1
Crested wheatgrass	Agropyron desertorum	2
Forbs		
Lewis flax	Linum perenne lewisii	1
Palmer penstemon	Penstemon palmerii	1
Small burnet	Sanguisorba minor	1
Shrubs		
Forage kochia	Kochia prostrata	2
Whitestem rabbitbrush	Chrysothamnus nauseosus albicaulis	1
Fourwing saltbush	Atriplex canescens	2
	Total	15
Pinyon/Juniper Areas		
Grasses		
Thickspike wheatgrass	Elymus lanceolatus	1.5
Intermediate wheatgrass	Elytrigia intermedia	1.5
Squirreltail	Elymus elymoides	2
Crested wheatgrass	Agropyron desertorum	2
Forbs		
Lewis flax	Linum perenne lewisii	1
Palmer penstemon	Penstemon palmerii	1
Shrubs		
Forage kochia	Kochia prostrata	2
Fourwing saltbush	Atriplex canescens	2
Wyoming big sagebrush	Artemesia tridentata wyomingensis var. Gordon Creek	1
Antelope bitterbrush	Purshia tridentata	1
	Total	15

Common Name	Scientific Name		Pounds per acre / PLS*
Mountain Brush Areas			
Grasses			
Sheep fescue	Festuca ovina		2
Smooth brome	Bromus inermis		2
Slender wheatgrass	Elymus trachycaulus		2
Intermediate wheatgrass	Elytrigia intermedia		1.5
Russian wildrye	Psathyrostachys juncea		1
Forbs			
Lewis flax	Linum perenne lewisii		1
Rocky Mt. penstemon	Penstemon strictus		1
Sainfoin	Onobrychis viciifolia		0.5
Shrubs			
Forage kochia	Kochia prostrata		2
Wyoming big sagebrush	Artemesia tridentata wyomingensis var. Gordon Creek		0.5
Antelope bitterbrush	Purshia tridentata		1
Mountain big sagebrush	Artemisia tridentata var. vaseyana		0.5
True Mt. mahogany	Cercocarpus montanus		1
		Total	16
Riparian Areas			
Grasses and Grasslike			
Reed canarygrass	Phalaris arundinacea		2
Streambank wheatgrass	Elymus lanceolatus riparium		4
** Nebraska sedge	Carex nebrascensis		
** Baltic rush	Juncus balticus		
Shrubs			
** Coyote willow	Salix exiqua		
Skunkbush sumac	Rhus trilobata var. trilobata		2
Trees			
** Narrowleaf cottonwood	Populus angustifolia		
		Total	8

* Seeding rate is listed as pounds per acre of pure live seed (PLS) drilled. Rate is increased by 50 percent if broadcast seeded.

Formula: pure live seed (PLS) = % seed purity x % seed germination.

** Sedge and rush root mass plugs, willow cuttings and cottonwood bare stock plantings will be done in the spring, within one month after high water flows, when the riparian water table and soil moisture will ensure planting success.

Rate of plantings per linear feet of disturbed stream bank is as follows: sedge and rush root mass plugs, one 4 inch diameter plug per 5 linear feet; willows, one cutting per linear foot; and cottonwood stock, one cluster planting of 7 trees per 25 linear feet. Individual cottonwood stock, within a planting cluster, would be spaced two foot apart. The willows and cottonwoods would be planted adjacent to the stream bank in moist soil, yet above the normal water line.

Shrub seed sources will be from the states of Colorado or Utah and from areas above elevations of 4,000 feet above sea level. Seed from these sources will provide more winter tolerant plants, thus increasing over-winter survival rates.

APPENDIX 3A
LOCATION AND WATER RIGHTS
OF SPRINGS IN PRICE COALBED METHANE PROJECT

APPENDIX 3A
LOCATION AND WATER RIGHTS OF SPRINGS IN PROJECT AREA

Location	Spring Name	Water Right	Flow (cfs)	Water Use	UNN	APP	PER	SUR	PTP	RED
TOWNSHIP 13S										
Sec. 14, T13S, R8E (NW 1/4, SE 1/4)	Unnamed	USA BLM 3212	.0000	--			X	X	X	
Sec. 17, T13S, R8E (SW 1/4, NW 1/4)*	Unnamed	Marakis, J. 3881	.0110	--			X	X	X	
Sec. 18, T13S, R8E (NE 1/4, NE 1/4)*	Unnamed	Marakis, H. 3672	.0110	--			X	X	X	
Sec. 18, T13S, R8E (SW 1/4, NE 1/4)*	Unnamed	Marakis, H. 3671	.0110	--			X	X	X	
Sec. 18, T13S, R8E (NW 1/4, SW 1/4)*	Unnamed	Jewkes, R & L 1935	.0110	--			X	X	X	
Sec. 18, T13S, R8E (NW 1/4, SW 1/4)*	Unnamed	Jewkes, R & L 1936	.0110	--			X	X	X	
Sec. 18, T13S, R8E (NW 1/4, SW 1/4)*	Unnamed	Jewkes, R & L 1937	.0110	--			X	X	X	
Sec. 18, T13S, R8E (SW 1/4, SE 1/4)*	Unnamed	Marakis, H. 3670	.0110	--			X	X	X	
Sec. 18, T13S, R8E (SW 1/4, SW 1/4)*	Unnamed	Jeweks, R & L 1938	.2500	--			X	X	X	
Sec. 18, T13S, R8E (SW 1/4, SW 1/4)*	Unnamed	Jeweks, R & L 1939	.2500	--			X	X	X	
Sec. 18, T13S, R8E (SW 1/4, SW 1/4)*	Unnamed	Jeweks, R & L 1940	.2500	--			X	X	X	
Sec. 19, T13S, R8E (NW 1/4, NW 1/4)*	Unnamed	Marakis, H. 3669	.0110	--			X	X	X	
Sec. 19, T13S, R8E (NE 1/4, NE 1/4)*	Unnamed	Sweet, F. 353	.0150	other			X	X		
Sec. 19, T13S, R8E (NE 1/4, NE 1/4)*	Unnamed	Sweet, F. 94	.1500	other			X	X		
Sec. 20, T13S, R8E (SE 1/4, NW 1/4)*	Unnamed	Jacob, C. 4095	.0110	stock watering			X	X	X	
Sec. 20, T13S, R8E (NW 1/4, SE 1/4)*	Unnamed	Jacob, C. 4096	.0110	stock watering			X	X	X	
Sec. 21, T13S, R8E (NW 1/4, NW 1/4)*	Unnamed	Marakis, H. 4099	.0110	stock watering			X	X	X	
Sec. 21, T13S, R8E (SW 1/4, NE 1/4)*	Unnamed	Marakis, J. 1676	.0110	--			X	X	X	
Sec. 27, T13S, R8E (SE 1/4, NW 1/4)*	Oak	UDWR 4979	.0000	stock watering, other			X	X		
Sec. 22, T13S, R9E (NW1/4, NW1/4)	Crystal	Elegante, J & B 624	.5000	--			X	X		
Sec. 22, T13S, R9E (NW1/4, NW1/4)	Crystal	Elegante, J. 2624	.5000	irrigation, domestic			X	X		
Sec. 22, T13S, R9E (NW1/4, NW1/4)	Crystal	Elegante, C & A 2632	.5000	irrigation, domestic			X	X		
Sec. 22, T13S, R9E (NW1/4, NW1/4)	Crystal	Elegante, J & B 3869	.5000	irrigation, domestic			X	X		
Sec. 22, T13S, R9E (NW1/4, NW1/4)	Crystal	Dambrosi, T. 3927	.5000	irrigation, domestic			X	X		
Sec. 22, T13S, R9E (NW1/4, NW1/4)	Crystal	Elegante, J. 626	.5000	--			X	X	X	
Sec. 22, T13S, R9E (NW1/4, NW1/4)	Crystal	Elegante, C & A 628	.5000	--			X	X	X	
Sec. 22, T13S, R9E (NW1/4, NW1/4)	Crystal	Dambrosi, T. 2623	.5000	--			X	X	X	
Sec. 22, T13S, R9E (NE 1/4, NE 1/4)	Goat	Elegante, C & A 2238	.0220	--			X	X	X	
Sec. 22, T13S, R9E (NE 1/4, NE 1/4)	Goat	Elegante, J. 625	.0220	--			X	X	X	
Sec. 22, T13S, R9E (NE 1/4, NE 1/4)	Goat	Elegante, J & B 2239	.0220	--			X	X	X	

APPENDIX 3A
LOCATION AND WATER RIGHTS OF SPRINGS IN PROJECT AREA

Location	Spring Name	Water Right		Flow (cfs)	Water Use	UNN	APP	PER	SUR	PTP	RED
Sec. 22, T13S, R9E (NE 1/4, NE 1/4)	Goat	Dambrosi, T.	2622	.0220	--			X	X	X	
Sec. 36, T13S, R9E (SW 1/4, SE 1/4)	Unnamed	Carbon County Country Club	262	.0440	other			X	X		
Sec. 30, T13S, R10E (SE1/4, NE1/4)	Unnamed	Cyprus Western Coal Co.	2338	.0330	stock watering			X	X	X	
Sec. 30, T13S, R10E (SE1/4, NE1/4)	Unnamed	Cyprus Western Coal Co.	2178	.0010	stock watering			X	X	X	
Sec. 34, T13S, R10E (SE 1/4, SE1/4)	Sage	USA BLM (Moab Dist.)	4397	.0150	stock watering, other			X	X	X	
TOWNSHIP 14S											
Sec. 1, T14S, R7E (SE 1/4, SW 1/4)	Unnamed	USA Forest Service	4360	.0150	stock watering			X	X	X	
Sec. 1, T14S, R7E (SW 1/4, SW 1/4)	Unnamed	USA Forest Service	4188	.0150	stock watering			X	X	X	
Sec. 24, T14S, R7E (NE 1/4, NE 1/4)	Unnamed	USA Forest Service	4326	.0150	stock watering			X	X	X	
Sec. 24, T14S, R7E (SE 1/4, NW 1/4)	Unnamed	USA Forest Service	4192	.0000	--			X	X	X	
Sec. 24, T14S, R7E (SE 1/4, SE 1/4)	Unnamed	USA Forest Service	4191	.0150	--			X	X	X	
Sec. 36, T14S, R7E (SE 1/4, SW 1/4)	First Water	USA Forest Service	4339	.0150	stock watering			X	X	X	
Sec. 8, T14S, R8E (NE 1/4, NW 1/4)*	Unnamed	Oman, M.	3097	.0110	domestic			X	X	X	
Sec. 8, T14S, R8E (NE 1/4, NW 1/4)*	Unnamed	Oman, M.	3099	.0110	domestic			X	X	X	
Sec. 8, T14S, R8E (SE 1/4, NW 1/4)*	Unnamed	Oman, M.	3101	.0110	domestic			X	X	X	
Sec. 13, T14S, R8E (NE 1/4, SE 1/4)	Unnamed	USA BLM (Moab Dist.)	4462	.0000	stock watering, other			X	X	X	
Sec. 13, T14S, R8E (SE 1/4, SE 1/4)	Kilo	USA BLM (Moab Dist.)	4636	.0150	stock watering, other			X	X	X	
Sec. 13, T14S, R8E (SE 1/4, SE 1/4)	Connie	USA BLM (Moab Dist.)	4637	.0150	stock watering, other			X	X	X	
Sec. 17, T14S, R8E (NE 1/4, SW 1/4)*	Unnamed	McIntire, B.	151	.0380	other			X	X		
Sec. 17, T14S, R8E (SW 1/4, SE 1/4)*	Unnamed	McIntire, B.	3436	.0110	stock watering			X	X	X	
Sec. 17, T14S, R8E (SW 1/4, SE 1/4)*	Unnamed	McIntire, B.	3437	.0110	stock watering			X	X	X	
Sec. 19, T14S, R8E (NE 1/4, NE 1/4)*	Unnamed	Oman, M.	3111	.0110	--			X	X	X	
Sec. 20, T14S, R8E (NE 1/4, SE 1/4)*	Unnamed	Jorgensen, R.	1171	.0110	--			X	X	X	
Sec. 20, T14S, R8E (NE 1/4, SE 1/4)*	Unnamed	Jorgensen, J.L.	1603	.0110	--			X	X	X	
Sec. 20, T14S, R8E (NE 1/4, SE 1/4)*	Unnamed	Jorgensen, J.C.	1611	.0110	--			X	X	X	
Sec. 20, T14S, R8E (NE 1/4, SE 1/4)*	Unnamed	Jorgensen, A.	1619	.0110	--			X	X	X	
Sec. 20, T14S, R8E (NE 1/4, SE 1/4)*	Unnamed	Jorgensen, T.	1627	.0110	--			X	X	X	
Sec. 20, T14S, R8E (SE 1/4, SE 1/4)*	Unnamed	Jorgensen, R.	1178	.0110	--			X	X	X	
Sec. 20, T14S, R8E (SE 1/4, SE 1/4)*	Unnamed	Jorgensen, J.L.	1604	.0110	--			X	X	X	

APPENDIX 3A
LOCATION AND WATER RIGHTS OF SPRINGS IN PROJECT AREA

Location	Spring Name	Water Right		Flow (cfs)	Water Use	UNN	APP	PER	SUR	PTP	RED
Sec. 20, T14S, R8E (SE 1/4, SE 1/4)*	Unnamed	Jorgensen, J.C.	1612	.0110	--			X	X	X	
Sec. 20, T14S, R8E (SE 1/4, SE 1/4)*	Unnamed	Jorgensen, A.	1620	.0110	--			X	X	X	
Sec. 20, T14S, R8E (SE 1/4, SE 1/4)*	Unnamed	Jorgensen, T.	1628	.0110	--			X	X	X	
Sec. 20, T14S, R8E (SE 1/4, SE 1/4)*	Unnamed	Jorgensen, R.	1179	.0110	--			X	X	X	
Sec. 20, T14S, R8E (SE 1/4, SE 1/4)*	Unnamed	Jorgensen, J.L.	1605	.0110	--			X	X	X	
Sec. 20, T14S, R8E (SE 1/4, SE 1/4)*	Unnamed	Jorgensen, J.C.	1613	.0110	--			X	X	X	
Sec. 20, T14S, R8E (SE 1/4, SE 1/4)*	Unnamed	Jorgensen, A.	1621	.0110	--			X	X	X	
Sec. 20, T14S, R8E (SE 1/4, SE 1/4)*	Unnamed	Jorgensen, T.	1629	.0110	--			X	X	X	
Sec. 20, T14S, R8E (SE 1/4, SE 1/4)*	Unnamed	Jorgensen, R.	1180	.0110	--			X	X	X	
Sec. 20, T14S, R8E (SE 1/4, SE 1/4)*	Unnamed	Jorgensen, J.L.	1606	.0110	--			X	X	X	
Sec. 20, T14S, R8E (SE 1/4, SE 1/4)*	Unnamed	Jorgensen, J.C.	1614	.0110	--			X	X	X	
Sec. 20, T14S, R8E (SE 1/4, SE 1/4)*	Unnamed	Jorgensen, A.	1622	.0110	--			X	X	X	
Sec. 20, T14S, R8E (SE 1/4, SE 1/4)*	Unnamed	Jorgensen, T.	1630	.0110	--			X	X	X	
Sec. 22, T14S, R8E (NE 1/4, NE 1/4)	Unnamed	Jorgensen, R.	3550	.0110	--			X	X	X	
Sec. 22, T14S, R8E (NE 1/4, NE 1/4)	Unnamed	Jorgensen, J.L.	3545	.0110	--			X	X	X	
Sec. 22, T14S, R8E (NE 1/4, NE 1/4)	Unnamed	Jorgensen, J.C.	3546	.0110	--			X	X	X	
Sec. 22, T14S, R8E (NE 1/4, NE 1/4)	Unnamed	Jorgensen, A.	3547	.0110	--			X	X	X	
Sec. 22, T14S, R8E (NE 1/4, NE 1/4)	Unnamed	Jorgensen, T.	3548	.0110	--			X	X	X	
Sec. 22, T14S, R8E (NW 1/4, NW 1/4)	Unnamed	Jorgensen, R.	3556	.0110	--			X	X	X	
Sec. 22, T14S, R8E (NW 1/4, NW 1/4)	Unnamed	Jorgensen, J.L.	3551	.0110	--			X	X	X	
Sec. 22, T14S, R8E (NW 1/4, NW 1/4)	Unnamed	Jorgensen, J.C.	3552	.0110	--			X	X	X	
Sec. 22, T14S, R8E (NW 1/4, NW 1/4)	Unnamed	Jorgensen, A.	3553	.0110	--			X	X	X	
Sec. 22, T14S, R8E (NW 1/4, NW 1/4)	Unnamed	Jorgensen, T.	3554	.0110	--			X	X	X	
Sec. 23, T14S, R8E (SW 1/4, SE 1/4)	Doe	USA BLM (Moab Dist.)	4453	.0150	stock watering, other			X	X	X	
Sec. 24, T14S, R8E (SW 1/4, NW 1/4)	Paula	USA BLM (Moab Dist.)	4569	.0150	stock watering, other			X	X	X	
Sec. 29, T14S, R8E (SE 1/4, SE 1/4)*	Unnamed	Burnside, S.	1658	.0110	--			X	X	X	
Sec. 31, T14S, R8E (SE 1/4, SE 1/4)*	Unnamed	Burnside, S.	1653	.0110	--			X	X	X	
Sec. 33, T14S, R8E (SW 1/4, NE 1/4)	Unnamed	State of Utah School & Institutional Trust	3558	.0110	--			X	X	X	
Sec. 34, T14S, R8E (SW 1/4, SE 1/4)	Wiregrass	USA BLM	2590	.0030	stock watering			X	X	X	

APPENDIX 3A
LOCATION AND WATER RIGHTS OF SPRINGS IN PROJECT AREA

Location	Spring Name	Water Right		Flow (cfs)	Water Use	UNN	APP	PER	SUR	PTP	RED
Sec. 35, T14S, R8E (SW 1/4, NE 1/4)	Wiregrass	USA BLM (Moab Dist.)	4602	.0150	stock watering, other			X	X	X	
Sec. 1, T14S, R9E (NW 1/4, NE 1/4)	Unnamed	Carbon County Special Service Recreation	a17644	.0000	irrigation		X		X		
Sec. 1, T14S, R9E (SW 1/4, NW 1/4)	Unnamed	Carbon County Special Service Recreation	a17644	.0000	irrigation		X				X
Sec. 1, T14S, R9E (SE 1/4, NW 1/4)	Unnamed	Carbon County Special Service Recreation	a17644	.0000	irrigation		X				X
Sec. 4, T14S, R9E (SW 1/4, NW 1/4)	Unnamed	Tower Resources Inc.	4303	.1000	other		X		X		
Sec. 15, T14S, R9E (SW 1/4, NW 1/4)	Aa	USA BLM (Moab Dist.)	4604	.0150	stock watering, other			X	X	X	
Sec. 20, T14S, R9E (SW 1/4, SW 1/4)	Unnamed	Thomas, A.	4788	.0110	stock watering			X	X		
Sec. 6, T14S, R10E (NW 1/4, SW 1/4)	Unnamed	Pitts, T.	4118	.5000	irrigation, stock watering			X	X		
Sec. 7, T14S, R10E (NE 1/4, NE 1/4)	Spring Areas (3)	Howard, R & B	560	.5000	irrigation, stock watering			X	X		
Sec. 7, T14S, R10E (SW 1/4, SE 1/4)	Unnamed	Ballard, M.	3863	.0110	stock watering			X	X	X	
Sec. 7, T14S, R10E (SW 1/4, SE 1/4)	Unnamed	Pace, L.	4062	.1000	stock watering			X	X	X	
Sec. 7, T14S, R10E (SW 1/4, SW 1/4)	Unnamed	Oliver, A.	3382	.0220	stock watering			X	X	X	
Sec. 14, T14S, R10E (NW 1/4, NE 1/4)	Deadman	Leautaud, A.	4313	.0150	stock watering			X	X		
Sec. 14, T14S, R10E (NE 1/4, NE 1/4)	Unnamed	Leautaud, A.	4312	.0150	stock watering			X	X		
Sec. 17, T14S, R10E (SW 1/4, NW 1/4)	Unnamed	Bryner, L. Bryner Trust, M.J.	1846	.0110	stock watering			X	X	X	
Sec. 17, T14S, R10E (NE 1/4, SW 1/4)	Spring Area	Gorishek, W & B	189	.6200	irrigation			X	X		
Sec. 18, T14S, R10E (NE 1/4, NW 1/4)	Unnamed	Pace, H.	2672	.0220	stock watering			X	X	X	
Sec. 18, T14S, R10E (NW 1/4, NE 1/4)	Unnamed	Pace, L.	4062	.1000	stock watering			X	X	X	
Sec. 18, T14S, R10E (NW 1/4, NW 1/4)	Unnamed	Bryner, B & L	2671	.0220	stock watering			X	X	X	
Sec. 20, T14S, R10E (NE 1/4, NE 1/4)	Unnamed	Fausett, M.	263	.1000	irrigation, stock watering			X	X		

APPENDIX 3A
LOCATION AND WATER RIGHTS OF SPRINGS IN PROJECT AREA

Location	Spring Name	Water Right		Flow (cfs)	Water Use	UNN	APP	PER	SUR	PTP	RED
TOWNSHIP 15S											
Sec. 3, T15S, R8E (NE 1/4, NE 1/4)	Unnamed	Smith, C.	76	.0055	stock watering			X	X	X	
Sec. 9, T15S, R8E (SW 1/4, SE 1/4)	Unnamed	Plateau Mining Company	59	.0134	domestic			X	X		
Sec. 10, T15S, R8E (NE 1/4, NW 1/4)	Smith	Smith, C & H	1651	.0110	stock watering			X	X	X	
Sec. 16, T15S, R8E (SW 1/4, NE 1/4)	Sage Brush	Plateau Mining Company	57	.0055	domestic			X	X		
Sec. 16, T15S, R8E (SW 1/4, NE 1/4)	Canyon (4) Springs	Plateau Mining Company	a14235	.0231	domestic, mining		X		X		
Sec. 17, T15S, R8E (NE 1/4, NW 1/4)	Unnamed	Plateau Mining Company	61	.0042	domestic			X	X		
Sec. 26, T15S, R8E (NE 1/4, SW 1/4)	Unnamed	Pierucci, V.	841	.0110	--			X	X	X	
Sec. 7, T15S, R9E (SE 1/4, NW 1/4)	North	Fiechko, F & C	4251	.0220	stock watering			X	X	X	
Sec. 30, T15S, R9E (NE 1/4, SE 1/4)	Unnamed	Frandsen, P & B	3270	.0110	--			X	X	X	
Sec. 30, T15S, R9E (NE 1/4, SE 1/4)	Unnamed	Frandsen, P & B	3269	.0110	--			X	X	X	
Sec. 30, T15S, R9E (NE 1/4, SE 1/4)	Unnamed	Frandsen, P & B	3268	.0110	--			X	X	X	
Sec. 30, T15S, R9E (NE 1/4, SE 1/4)	Unnamed	Frandsen, P & B	3267	.0110	--			X	X	X	
Sec. 30, T15S, R9E (NW 1/4, SE 1/4)	Unnamed Spring Area	DuVels Inc.	4791	1.5000	irrigation, domestic, stock watering	X			X		
Sec. 33, T15S, R9E (NW 1/4, NW 1/4)	Unnamed	Marsing, P.	197	.4700	irrigation, domestic, stock watering			X	X		
Sec. 1, T15S, R10E (NW 1/4, SE 1/4)	Unnamed	Pilling, D & D	1167	.0110	stock watering			X	X	X	
Sec. 17, T15S, R10E (SE 1/4, NE 1/4)	Unnamed	Hamaker, M.	3941	.0220	stock watering			X	X	X	
Sec. 29, T15S, R10E (SE 1/4, NW 1/4)	Unnamed	Marsing, O.	35	.1000	domestic			X	X		
Sec. 29, T15S, R10E (SE 1/4, NW 1/4)	Unnamed	Marsing, O.	3890	.1000	--			X	X	X	
Sec. 29, T15S, R10E (SE 1/4, NW 1/4)	Unnamed	Marsing, O.	129	.0007	stock watering			X	X	X	
Sec. 7, T15S, R11E (NW 1/4, NW 1/4)	Unnamed	Holm, T & J	4158	.2500	irrigation, domestic, stock watering	X			X		

APPENDIX 3A
LOCATION AND WATER RIGHTS OF SPRINGS IN PROJECT AREA

Location	Spring Name	Water Right	Flow (cfs)	Water Use	UNN	APP	PER	SUR	PTP	RED
TOWNSHIP T16S										
Sec. 5, T16S, R8E (SE 1/4, NW 1/4)	Unnamed	United States Fuel Company 964	.0204	municipal	X			X		
Sec. 6, T16S, R8E (SE 1/4, NW 1/4)	Boy Scout	Intermountain Power Service Corp. 509	.0110	stock watering			X	X	X	
Sec. 6, T16S, R8E (NE 1/4, SW 1/4)	North Boy Scout	Intermountain Power Agency 508	.0110	stock watering			X	X	X	
Sec. 6, T16S, R8E (NE 1/4, SW 1/4)	West Boy Scout	Intermountain Power Service Corp. 510	.0110	stock watering			X	X	X	
Sec. 6, T16S, R8E (NE 1/4, SW 1/4)	South Boy Scout	Intermountain Power Service Corp. 511	.0110	stock watering			X	X	X	
Sec. 7, T16S, R8E (NW 1/4, SE 1/4)	Mud	Intermountain Power Service Corp. 161	.0110	stock watering			X	X	X	
Sec. 19, T16S, R8E (NE 1/4, NE 1/4)	Wild Horse Ridge	USA Forest Service 1428	.0110	stock watering			X	X	X	
Sec. 20, T16S, R8E (NE 1/4, NE 1/4)	Right Fork Fish Creek	USA Forest Service 1427	.0110	stock watering			X	X	X	
Sec. 21, T16S, R8E (SW 1/4, NW 1/4)	Head Hollow	USA Forest Service 1426	.0110	stock watering			X	X	X	
Sec. 21. T16S, R8E (SE 1/4, SW 1/4)	Ottsen Hollow	USA Forest Service 1425	.0110	stock watering			X	X	X	
Sec. 28, T16S, R8E (SW 1/4, NE 1/4)	Otteson Hollow	USA BLM (Moab Dist.) 3047	.0011	stock watering			X	X	X	
Sec. 9, T16S, R9E (NE 1/4, NW 1/4)	Coyote	USA BLM (Moab Dist.) 4514	.0150	stock watering, other			X	X	X	
Sec. 20, T16S, R9E (NW 1/4, NW 1/4)	Cottonwood	USA BLM 2568	.0060	--			X	X	X	
Sec. 21. T16S, R9E (SW 1/4, NW 1/4)	Cleveland Wash	USA BLM 2122	.0110	--			X	X	X	
Sec. 26, T16S, R9E (NE 1/4, SW 1/4)	Poison	USA BLM 3160	.0110	--			X	X	X	

APPENDIX 3A
LOCATION AND WATER RIGHTS OF SPRINGS IN PROJECT AREA

Location	Spring Name	Water Right		Flow (cfs)	Water Use	UNN	APP	PER	SUR	PTP	RED
Sec. 29, T16S, R10E (NE 1/4, SE 1/4)	Unnamed	Snowball, R & P	155	1.2600	irrigation			X	X		
Sec. 32, T16S, R10E (SW 1/4, NW 1/4)	Unnamed	Jensen, K & H	3880	.0110	stock watering			X	X	X	

Source: Utah Dept. of Natural Resources, Division of Water Rights (UDNR). PLAT Database Information Search. Dec. 27, 1995

UNN - Unapproved Application
APP - Approved Application
PER - Perfected Right (Certified, etc.)
SUR - Surface Water Source
PTP - Point-to-Point Diversion
RED - Point of Re-diversion
-- Water use not specified
* Springs potentially associated with high angle faults (see text - Section 4.2.1.1).

APPENDIX 3B
SOIL SENSITIVITY CHARACTERISTICS OF THE PRICE COALBED METHANE PROJECT

APPENDIX 3B
SOIL SENSITIVITY CHARACTERISTICS OF THE PRICE COALBED METHANE PROJECT AREA

Map No.	Soil Map Unit	Texture	Slope(%)	Erodibility Water	Erodibility Wind	Salinity (mmhos/cm)	Cover Soil Suitability[1]
Carbon County							
1	Atrac	Sandy loam	1 - 6	M	M	<2	Good
2	Badland	Barren shale	Steep to very steep	A	--	--	Unsuitable
3	Badland/Rubbleland Rock Outcrop	Barren shale/Stones, boulders/Bedrock	Steep to very steep	A/--/--	--	--	Unsuitable
7	Beje/Trag	Loam/Clay loam	3 - 30	M/M	SL/--	<2/<2	Good
8	Billings	Silty clay loam	1 - 3	M	M	2 - 8	Fair
9	Billings/Gullied land	Silty clay loam/Eroded areas 3' 10' deep	1 - 6	M/--	M/--	>8/--	Poor: gullied land
11	Cabba	Sandy loam	40 - 70	H	--	<2	Fair - Good
13	Cabba/Guben - Rock Outcrop	Loam/Loam/Sandstone and shale	40 - 75	H/H/--	--/--/--	<2/<2/--	Fair - Poor: rock, slope
16	Chipeta	Silty clay loam	8 - 15	SV	M	8 - 16	Fair
17	Chipeta/Badland	Silty clay loam/Barren shale	3 - 20	VH/A	M/--	8 - 16/--	Poor
18	Chipeta/Persayo	Silty clay loam/Loam	1 - 3	M/M	M/M	8 - 16/<8	Fair
19	Chupadera	Sandy loam	1 - 8	M	M	<2	Fair - Good
20	Comodore/Datino	Sandy loam/Sandy loam	40 - 60	H/H	--/--	<2/<2	Fair
28	Doney/Toze	Loam/Loam	50 - 90	H/H	--/--	<2/<2	Fair
29	Dumps, mine	Coal, harshale, sandstone	--	--	--	--	Unsuitable
31	Ferron	Silt loam	0 - 3	SL	--	2 - 8	Fair - Good
33	Gerst/Badland/Rubbleland	Loam/Barren shale/Stones and boulders	15 - 50	H/--/--	--/--/--	<2/--/--	Poor: barren shale and rock
34	Gerst/Badland/Rubbleland	Loam/Barren shale/Stones and boulders	50 - 70	H/--/--	--/--/--	<2/--/--	Poor: barren shale and rock
35	Gerst/Balland/Stormitt	Loam/Barren shale/Sandy clay loam	10 - 60	M/A/H	--/--/--	<2/--/<2	Fair - Poor: barren shale
36	Gerst/Strych/Badland	Loam/Loam/Barren shale	3 - 50	SV/SV/A	--/--/--	<2/<2/--	Fair - Poor: barren shale
37	Gerst/Strych/Badland	Loam/Loam/Barren shale	50 - 70	H/H/A	--/--/--	<2/<2/--	Fair - Poor: barren shale
38	Gerst/Travessilla	Loam/Sandy loam	3 - 40	H/H	--/M	<2/<2	Fair

APPENDIX 3B
SOIL SENSITIVITY CHARACTERISTICS OF THE PRICE COALBED METHANE PROJECT AREA

Map No.	Soil Map Unit	Texture	Slope(%)	Erodibility Water	Erodibility Wind	Salinity (mmhos/cm)	Cover Soil Suitability[1]
40	Glenberg	Sandy loam	3 - 6	M	M	<2	Fair - Good
41	Green River/Juva variant	Silt loam/Sandy loam	0 - 5	SL/SL	M/M	<8/<8	Fair
42	Greybull	Loam	3 - 8	M	M	<2	Fair - Good
46	Guben/Pathead	Loam/Loam	30 - 50	M/M	--/--	<2/<2	Fair
47	Guben/Rock Outcrop	Sandy loam/Sandstone, shale	50 - 80	SL/--	--/--	<2/--	Fair
48	Haverdad	Loam	1 - 8	M	M	<2	Good
49	Haverdad	Loam	0 - 3	M	M	<4	Fair
50	Haverdad	Loam	1 - 5	M	M	<2	Good
51	Hernandez	Loam	1 - 3	M	M	<4	Fair
52	Hernandez	Loam	3 - 8	M	M	<4	Fair
53	Hernandez	Sandy loam	1 - 6	M	M	<4	Fair
54	Hernandez/Atrac	Sandy loam/Sandy loam	1 - 6	M/M	M/M	<4/<2	Fair - Good
55	Hunting	Loam	1 - 3	SL	M	2 - 8	Fair
56	Hunting	Loam	1 - 3	SL	M	8 - 16	Fair
57	Hunting	Silty clay loam	1 - 3	SL	M	2 - 8	Fair
58	Jura varient	Sandy loam	1 - 5	SL	M	<8	Fair
59	Killpack	Clay loam	1 - 3	M	M	2 - 8	Fair
60	Killpack	Clay loam	3 - 6	H	M	2 - 8	Fair
61	Libbings	Silty clay loam	0 - 3	M	M	>16	Fair - Poor: salinity
63	Midfork/Podo	Loam/Loam	30 - 70	H/H	--/--	<2/<2	Fair
64	Minchey	Loam	1 - 3	M	M	<4	Fair - Good
65	Mivida	Sandy loam	1 - 6	M	M	<2	Fair
70	Nelman/Travessilla/Rock Outcrop	Loam/Sandy loam/ Sandstone	8 - 50	M/H/--	--/M/--	<2/<2/--	Fair - Poor: barren rock
72	Pathead/Curecanti	Loam/Loam	50 - 70	H/H	--/--	<2/<2	Fair
73	Penoyer variant	Loam	1 - 3	SL	M	<2	Good
74	Penoyer variant	Loam	3 - 6	M	M	<2	Good
75	Perma	Sandy loam	15 - 40	H	--	<2	Fair
80	Persayo/Chipeta	Loam/Silty clay loam	3 - 20	M/H	M/M	<8/8 - 16	Fair
81	Persayo/Greybull	Loam/Loam	3 - 8	M/M	--/M	<8/<2	Fair

APPENDIX 3B
SOIL SENSITIVITY CHARACTERISTICS OF THE PRICE COALBED METHANE PROJECT AREA

Map No.	Soil Map Unit	Texture	Slope(%)	Erodibility Water	Erodibility Wind	Salinity (mmhos/cm)	Cover Soil Suitability[1]
89	Rafael	Silty clay loam	1 - 3	SL	--	4 - 16	Fair
90	Ravola	Loam	1 - 3	M	M	2 - 8	Fair
91	Ravola	Loam	1 - 6	M	M	2 - 8	Fair
92	Ravola/Gullied land	Loam/10-15 ft. deep barren gullies	1 - 6	M/--	M/--	2 - 8/--	Fair - Poor: gullied land
93	Ravola/Slickspots	Loam/Loam	1 - 3	M/--	M/--	2 - 8/--	Fair - Poor: slick spots
94	Riverwash	Streambeds or riverbeds exposed when water level is low	--	--	--	--	Unsuitable
95	Rock Outcrop	Sandstone, siltstone, shale	--	--	--	--	Unsuitable
96	Rock Outcrop/ Rubbleland/Travessilla	Sandstone, limestone/Stones, boulders/Sandy loam	30 - 70	--/--/SV	--/--/--	--/--/<2	Fair - Poor: barren rock
97	Rottulee/Trag	Loam/Loam	30 - 60	M/H	M/--	<2/<2	Fair
98	Sagers	Silty clay loam	1 - 3	M	M	2 - 8	Fair
99	Saltair	Silty clay loam	0 - 3	SL	M	>16	Fair - Poor: salinity
107	Shupert/Winetti	Loam/Sandy loam	1 - 8	M/SL	--/--	<2/<2	Fair
110	Stormitt	Sandy clay loam	3 - 10	SL	--	<2	Fair
111	Stormitt/Minchey	Sandy clay loam/Loam	3 - 10	M/M	--/M	<2/<4	Fair
113	Strych	Loam	3 - 15	M	--	<2	Fair
114	Strych	Loam	3 - 30	M	--	<2	Fair
116	Trag/Beje/Routtulee	Loam/Loam/Loam	3 - 30	SL/M/M	--/--/M	<2/<2/<2	Good
117	Trag/Beje/Senchert	Clay loam/Loam/Loam	3 - 30	M/SL/M	--/--/--	<2/<2/<2	Good
119	Travessilla	Sandy loam	1 - 8	M	M	<2	Good
120	Travessilla/Rock Outcrop	Sandy loam/Sandstone	3 - 20	M/--	M/--	<2/--	Fair - Poor: barren rock
122	Travessilla/Travessilla family/Rock Outcrop	Sandy loam/Sandy loam/ Sandstone	30 - 80	H/H/--	M/--/--	<2/<2/--	Fair - Poor: barren rock

APPENDIX 3B
SOIL SENSITIVITY CHARACTERISTICS OF THE PRICE COALBED METHANE PROJECT AREA

Map No.	Soil Map Unit	Texture	Slope(%)	Erodibility Water	Erodibility Wind	Salinity (mmhos/cm)	Cover Soil Suitability[1]
Emery County							
Ab	Abbott	Silty clay	1 - 3	SL	--	4 - >16	Fair - Poor: salinity
BlB	Billings	Silty clay loam	1 - 3	--	--	4 - 16	Fair
BlC2	Billings	Silty clay loam	1 - 6	M	M	4 - 16	Fair
Ba	Badland	Eroding shale outcrops	--	--	--	--	Unsuitable
CBF2	Chipeta/Badland	Silty clay loam/Eroding shale	3 - 30	VH/--	--/--	8 - >16/--	Fair - Poor: barren shale, salinity
CPB	Chipeta/Persayo	Silty clay loam/Loam	1 - 3	M/M	--	8 - >16/4 - >16	Fair - Poor: salinity
CPE2	Chipeta/Persayo	Silty clay loam/Loam	3 - 20	H/H	--/--	8 - >16/4 - >16	Fair - Poor: salinity
Gu	Gullied land	10'-25' deep gullies less than 100' apart	--	--	--	--	Unsuitable
Hs	Hunting	Loam	1 - 3	M	--	4 - >16	Fair
KlB	Killpack	Clay loam	1 - 3	M	--	4 - 16	Fair - Poor: salinity
KlC2	Killpack	Clay loam	3 - 6	H	M	4 - 16	Fair
KeE2	Kenilworth	Sandy loam	0 - 20	SL - M	--	None	Good - Fair
KpB	Killpack	Loam	1 - 3	M	--	4 - 16	Fair
KpC2	Killpack	Loam	3 - 6	H	--	4 - 16	Fair
Lb	Libbings	Silty clay loam	0 - 3	M	--	>16	Fair - Poor: salinity
Ls	Libbings	Silty clay loam	0 - 3	M	--	>16	Fair - Poor: salinity
MsB	Minchey/Sanpete	Loam/Sandy clay loam	1 - 3	M/M	--/--	None/None	Fair
MsC2	Minchey/Sanpete	Loam/Sandy clay loam	1 - 6	M/M	--/--	None/None	Fair
PCE2	Persayo/Chipeta	Loam/Silty clay loam	3 - 20	M/H	M/M	8 - >16	Fair - Poor: salinity
PdB	Palisade	Sandy loam	1 - 3	M	--	None	Good - Fair
PdC2	Palisade	Sandy loam	3 - 6	H	--	None	Good - Fair
PeB	Penoyer	Loam	1 - 3	M	--	0 - 8	Fair
PeC2	Penoyer	Loam	3 - 6	M	M	0 - 8	Fair
PoB	Penoyer	Silty clay loam	1 - 3	--	--	0 - 8	Fair
RlB	Ravola	Loam	1 - 3	M	--	0 - 16	Fair
RlB2	Ravola	Loam	1 - 6	M	M	0 - 16	Fair
RlC2	Ravola	Loam	3 - 6	M	M	0 - 16	Fair

APPENDIX 3B
SOIL SENSITIVITY CHARACTERISTICS OF THE PRICE COALBED METHANE PROJECT AREA

Map No.	Soil Map Unit	Texture	Slope(%)	Erodibility Water	Erodibility Wind	Salinity (mmhos/cm)	Cover Soil Suitability[1]
Ra	Rafael	Silty clay loam	1 - 3	SL	--	8 - >16	Fair - Poor: salinity
RtB	Ravola	Silty clay loam	1 - 3	--	--	0 - 16	Good - Fair
RUB2	Ravola/Bunderson	Loam/Loam	1 - 3	H/H	--/--	0 - 16	Fair
Ry	Rockland	Stones, boulders, shale, sandstone	50 - 80	A	--	--	Unsuitable
SlB	Sanpete	Sandy clay loam	1 - 3	M	--	None	Fair
SlD2	Sanpete	Sandy clay loam	3 - 10	H	--	None	Fair
Sn	Shaly colluvial land	Cobblestones, rock fragments, shale outcrops	--	A	--	--	Unsuitable
Sa	Saltair	Silty clay loam	0 - 3	SL	>16	--	Fair - Poor: salinity
SmD2	Sanpete/Minchey	Sandy clay loam/Loam	1 - 10	H/M	--	None/None	Fair
Wo	Woodrow	Silty clay loam	1 - 3	M	--	0 - 8	Fair

1 Rating based on criteria on Table 3.4-2
M Moderate
H High
VH Very High
SV Severe
SL Slight
A Actively eroding
-- Data not estimated or rated

Source: USDA, SCS 1988, 1970.

APPENDIX 3C

LETTERS FROM FISH AND WILDLIFE SERVICE

REGARDING THREATENED AND ENDANGERED SPECIES

United States Department of the Interior
FISH AND WILDLIFE SERVICE
UTAH FIELD OFFICE
LINCOLN PLAZA
145 EAST 1300 SOUTH, SUITE 404
SALT LAKE CITY, UTAH 84115

In Reply Refer To
(CO/KS/NE/UT)

May 15, 1996

Mr. Jeff Dawson, Consulting Scientist
Woodward-Clyde Consultants
Stanford Place 3, Suite 1000
4582 South Ulster Street
Denver, Colorado 80237-2637

Subject: Endangered species List For Price Coalbed Methane Project Environmental Impact Statement

Dear Mr. Dawson:

We have received your request for a list of endangered and threatened species that may occur in the area of influence of your proposed action. Enclosed are lists of threatened, endangered, and candidate species by county. While candidate species have no legal protection under the Endangered Species Act, we ask that you try to avoid them if they are found in the area.

Only a Federal Agency can enter into formal section 7 consultation with the Service. A Federal Agency may designate a non-Federal representative to conduct informal consultation or prepare a biological assessment by giving written notice to the Service of such a designation. The ultimate responsibility for compliance with section 7 remains with the Federal Agency, in this case the Bureau of Land Management.

The proposed action should be reviewed and a determination made if the action may affect any listed species or their critical habitat. A determination also should be made if the action is likely to jeopardize a proposed species or result in the destruction or adverse modification of any proposed critical habitat. If the determination is "may affect" for listed species, formal section 7 consultation should be requested by the Federal Agency to the Assistant Field Supervisor at the address given above. In addition, if a determination is made that the proposed action may jeopardize proposed species or result in the destruction or adverse modification of proposed critical habitat, the Federal Agency must confer with this office. At that time, the Federal Agency should provide this office with a copy of a biological assessment or any other relevant information that was used in reaching its conclusion.

Your attention is also directed to Section 7(d) of the Endangered Species Act, as amended, which underscores the requirement that the Federal agency or the applicant shall not make any irreversible or irretrievable commitment of resources during the consultation period

which, in effect, would deny the formulation or implementation of reasonable and prudent alternatives regarding their actions on any endangered or threatened species.

In addition to a species list, you also requested some information on potential mitigation requirements for water depletions from the Colorado River and its effects on the endangered fish of the river. Small depletions, less than 100 acre feet average annual depletion, are currently covered by the Recovery Implementation Program and the fees are waived. Depletions in the range of 100 to 1500 ac/ft per year are mitigated through monetary compensation at the rate of $13.04 per ac/ft. This rate is adjusted annually for inflation. The fiscal year 1997 rate will be $13.47. Projects depleting greater than 1500 ac/ft per year are mitigated through implementation of the Recovery Implementation Program Recovery Action Plan (RIPRAP) items.

Your letter also requested some additional information concerning the current status of former category 2 candidate species. The proposed rule that appeared in the February 28, 1996 Federal Register Notice of Review for plant and animal taxa presented an updated list of candidate species which eliminated the various category designations from the species. The current candidate list only includes those candidate species for which the Service has on file sufficient information on biological vulnerability and threats to support issuance of a proposed rule to list but issuance of the proposed rule is precluded. The species formerly identified as category 2 candidates are now referred to as species at risk or species of special concern. The Service does not maintain a list of previous category 2 species but is in the process of developing a memorandum of agreement with the Natural Heritage Program. The Natural Heritage Program maintains a database of all species of concern throughout the United States. The Service will be utilizing this database to keep informed of the status of former category 2 species.

If we can be of further assistance, please feel free to contact our office at (801) 524-5001.

Sincerely,

Robert D. Williams
Assistant Field Supervisor

Enclosures

FEDERALLY LISTED AND PROPOSED (P) ENDANGERED (E) AND THREATENED (T) SPECIES AND HABITAT IN UTAH BY COUNTY
As of April 1996

COUNTY / Species	Scientific Name	Status
BEAVER		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Peregrine Falcon[1]	*Falco peregrinus*	E
Utah Prairie Dog	*Cynomys parvidens*	T
BOX ELDER		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Peregrine Falcon[1]	*Falco peregrinus*	E
Lahontan Cutthroat Trout	*Oncorhynchus (=Salmo) clarki henshawi*	T
CACHE		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Maguire Primrose	*Primula maguirei*	T
Peregrine Falcon[1]	*Falco peregrinus*	E
CARBON		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Black-footed Ferret[6]	*Mustela nigripes*	E
Bonytail Chub[4]	*Gila elegans*	E
Colorado Squawfish[4]	*Ptychocheilus lucius*	E
Humpback Chub[4]	*Gila cypha*	E
Peregrine Falcon[1]	*Falco peregrinus*	E
Razorback Sucker[4]	*Xyrauchen texanus*	E
DAGGETT		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Black-footed Ferret[6]	*Mustela nigripes*	E
Bonytail Chub[4]	*Gila elegans*	E
Colorado Squawfish[4]	*Ptychocheilus lucius*	E
Humpback Chub[4]	*Gila cypha*	E
Peregrine Falcon[1]	*Falco peregrinus*	E
Razorback Sucker[4]	*Xyrauchen texanus*	E
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Whooping Crane[2]	*Grus americanus*	E
DAVIS		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Peregrine Falcon[1]	*Falco peregrinus*	E

FEDERALLY LISTED AND PROPOSED (P) ENDANGERED (E) AND THREATENED (T) SPECIES AND HABITAT IN UTAH BY COUNTY
As of April 1996

COUNTY / Species	Scientific Name	Status
DUCHESNE		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Barneby Ridge-cress	*Lepidium barnebyanum*	E
Black-footed Ferret[6]	*Mustela nigripes*	E
Bonytail Chub[4]	*Gila elegans*	E
Colorado Squawfish[4]	*Ptychocheilus lucius*	E
Humpback Chub[4]	*Gila cypha*	E
Peregrine Falcon[1]	*Falco peregrinus*	E
Razorback Sucker[4]	*Xyrauchen texanus*	E
Shrubby Reed-mustard	*Schoenocrambe suffrutescens*	E
Uinta Basin Hookless Cactus	*Sclerocactus glaucus*	T
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Whooping Crane[2]	*Grus americanus*	E
EMERY		
Bald Eagle[1]	*Haliaeetus leucocephalus*	T
Barneby Reed-mustard	*Schoenocrambe barnebyi*	E
Black-footed Ferret[6]	*Mustela nigripes*	E
Bonytail Chub[4]	*Gila elegans*	E
Colorado Squawfish[4]	*Ptychocheilus lucius*	E
Humpback Chub[4]	*Gila cypha*	E
Jones Cycladenia	*Cycladenia humilis* var. *jonesii*	T
Last Chance Townsendia	*Townsendia aprica*	T
Maguire Daisy[7]	*Erigeron maguirei*	E
Peregrine Falcon[1]	*Falco peregrinus*	E
Razorback Sucker[4]	*Xyrauchen texanus*	E
San Rafael Cactus	*Pediocactus despainii*	E
Wright Fishhook Cactus	*Sclerocactus wrightiae*	E
GARFIELD		
Autumn Buttercup	*Ranunculus aestivalis*	E
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Black-footed Ferret[6]	*Mustela nigripes*	E
Bonytail Chub[4]	*Gila elegans*	E
Colorado Squawfish[4]	*Ptychocheilus lucius*	E
Humpback Chub[4]	*Gila cypha*	E
Jones Cycladenia	*Cycladenia humilis* var. *jonesii*	T
Mexican Spotted Owl[1]	*Strix occidentalis lucida*	T
Peregrine Falcon[1]	*Falco peregrinus*	E
Razorback Sucker[4]	*Xyrauchen texanus*	E

FEDERALLY LISTED AND PROPOSED (P) ENDANGERED (E) AND THREATENED (T) SPECIES AND HABITAT IN UTAH BY COUNTY
As of April 1996

COUNTY Species	Scientific Name	Status
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	E
Utah Prairie Dog	*Cynomys parviden*	T
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
GRAND		
Bald Eagle[1]	*Haliaeetus leucocephalus*	T
Black-footed Ferret[6]	*Mustela nigripes*	E
Bonytail Chub[4]	*Gila elegans*	E
Colorado Squawfish[4]	*Ptychocheilus lucius*	E
Humpback Chub[4]	*Gila cypha*	E
Jones Cycladenia	*Cycladenia humilis* var. *jonesii*	T
Mexican Spotted Owl[1]	*Strix occidentalis lucida*	T
Peregrine Falcon[1]	*Falco peregrinus*	E
Razorback Sucker[4]	*Xyrauchen texanus*	E
Whooping Crane[2]	*Grus americanus*	E
IRON		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Mexican Spotted Owl[1]	*Strix occidentalis lucida*	T
Peregrine Falcon[1]	*Falco peregrinus*	E
Utah Prairie Dog	*Cynomys parvidens*	T
JUAB		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Least Chub	*Iotichthys plegethontis*	PE
Peregrine Falcon[1]	*Falco peregrinus*	E
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
KANE		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Jones Cycladenia	*Cycladenia humilis* var. *jonesii*	T
Kanab Ambersnail[5]	*Oxyloma haydeni kanabensis*	E
Kodachrome Bladderpod	*Lesquerella tumulosa*	E
Mexican Spotted Owl[1]	*Strix occidentalis lucida*	T
Peregrine Falcon[1]	*Falco peregrinus*	E
Siler Pincushion Cactus	*Pediocactus sileri*	T
Southwestern Willow Flycatcher[6]	*Empidonax traillii extimus*	E
Welsh's Milkweed[4]	*Asclepias welshii*	T

FEDERALLY LISTED AND PROPOSED (P) ENDANGERED (E) AND THREATENED (T) SPECIES AND HABITAT IN UTAH BY COUNTY
As of April 1996

COUNTY Species	Scientific Name	Status
MILLARD		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Least Chub	*Iotichthys plegethontis*	PE
Peregrine Falcon[1]	*Falco peregrinus*	E
MORGAN		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Peregrine Falcon[1]	*Falco peregrinus*	E
PIUTE		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Peregrine Falcon[1]	*Falco peregrinus*	E
Utah Prairie Dog	*Cynomys parvidens*	T
RICH		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Black-footed Ferret[6]	*Mustela nigripes*	E
Peregrine Falcon[1]	*Falco peregrinus*	E
Whooping Crane[2]	*Grus americanus*	E
SALT LAKE		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Peregrine Falcon[1]	*Falco peregrinus*	E
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
SAN JUAN		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Black-footed Ferret[6]	*Mustela nigripes*	E
Colorado Squawfish[4]	*Ptychocheilus lucius*	E
Mexican Spotted Owl[1,4]	*Strix occidentalis lucida*	T
Navajo Sedge[4]	*Carex specuicola*	T
Peregrine Falcon[1]	*Falco peregrinus*	E
Razorback Sucker[4]	*Xyrauchen texanus*	E
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	E
SANPETE		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Heliotrope Milkvetch[4]	*Astragalus montii*	T
Peregrine Falcon[1]	*Falco peregrinus*	E

FEDERALLY LISTED AND PROPOSED (P) ENDANGERED (E) AND THREATENED (T) SPECIES AND HABITAT IN UTAH BY COUNTY
As of April 1996

COUNTY / Species	Scientific Name	Status
SEVIER		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Heliotrope Milkvetch[4]	*Astragalus montii*	T
Last Chance Townsendia	*Townsendia aprica*	T
Peregrine Falcon[1]	*Falco peregrinus*	E
Utah Prairie Dog	*Cynomys parvidens*	T
SUMMIT		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Black-footed Ferret[6]	*Mustela nigripes*	E
Peregrine Falcon[1]	*Falco peregrinus*	E
Whooping Crane[2]	*Grus americanus*	E
TOOELE		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Least Chub	*Iotichthys plegethontis*	PE
Peregrine Falcon[1]	*Falco peregrinus*	E
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
UINTAH		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Black-footed Ferret[6]	*Mustela nigripes*	E
Bonytail Chub[4]	*Gila elegans*	E
Clay Reed-mustard	*Schoenocrambe argillacea*	T
Colorado Squawfish[4]	*Ptychocheilus lucius*	E
Humpback Chub[4]	*Gila cypha*	E
Mexican Spotted Owl[6]	*Strix occidentalis lucida*	T
Peregrine Falcon[1]	*Falco peregrinus*	E
Razorback Sucker[4]	*Xyrauchen texanus*	E
Shrubby Reed-mustard	*Schoenocrambe suffrutescens*	E
Uinta Basin Hookless Cactus	*Sclerocactus glaucus*	T
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Whooping Crane[2]	*Grus americanus*	E

FEDERALLY LISTED AND PROPOSED (P) ENDANGERED (E) AND THREATENED (T) SPECIES AND HABITAT IN UTAH BY COUNTY
As of April 1996

COUNTY / Species	Scientific Name	Status
UTAH		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Clay Phacelia	*Phacelia argillacea*	E
June Sucker[4]	*Chasmistes liorus*	E
Peregrine Falcon[1]	*Falco peregrinus*	E
Utah Valvata Snail[6]	*Valvata utahensis*	E
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
WASATCH		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Peregrine Falcon[1]	*Falco peregrinus*	E
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
WASHINGTON		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Desert Tortoise[4]	*Gopherus agassizii*	T
Dwarf-Bear Poppy	*Arctomecon humilis*	E
Mexican Spotted Owl[1]	*Strix occidentalis lucida*	T
Peregrine Falcon[1]	*Falco peregrinus*	E
Siler Pincushion Cactus	*Pediocactus sileri*	T
Southwestern Willow Flycatcher[1]	*Empidonax traillii extimus*	E
Virgin River Chub[5]	*Gila seminuda*	E
Woundfin[5]	*Plagopterus argentissimus*	E
WAYNE		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Barneby Reed-mustard	*Schoenocrambe barnebyi*	E
Black-footed Ferret[6]	*Mustela nigripes*	E
Bonytail Chub[4]	*Gila elegans*	E
Colorado Squawfish[4]	*Ptychocheilus lucius*	E
Humpback Chub[4]	*Gila cypha*	E
Last Chance Townsendia	*Townsendia aprica*	T
Mexican Spotted Owl[1,4]	*Strix occidentalis lucida*	T
Peregrine Falcon[1]	*Falco peregrinus*	E
Razorback Sucker[4]	*Xyrauchen texanus*	E
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	E
Utah Prairie Dog	*Cynomys parvidens*	T
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Winkler Cactus	*Pediocactus winkleri*	PE
Wright Fishhook Cactus	*Sclerocactus wrightiae*	E

FEDERALLY LISTED AND PROPOSED (P) ENDANGERED (E) AND THREATENED (T) SPECIES AND HABITAT IN UTAH BY COUNTY
As of April 1996

COUNTY / Species	Scientific Name	Status
WEBER		
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Peregrine Falcon[1]	*Falco peregrinus*	E
Ute Ladies'-tresses	*Spiranthes diluvialis*	T

[1]Nests in this county of Utah..

[2]Migrates through Utah, no resident populations.

[3]Wintering populations (only three known nesting pairs in southeastern Utah).

[4]Critical habitat designated in this county.

[5]Critical habitat proposed in this county.

[6]Historical range.

[7]Proposed downlisting to threatened.

For additional information contact: U.S. Fish and Wildlife Service, 145 East 1300 South Suite 404, Salt Lake City, Utah 84115 Telephone: (801) 524-5001

UTAH CANDIDATE SPECIES BY COUNTY

Updated: April, 1996
Taken From Notice of Review Published in the Federal Register
61 FR 7596 (February 28, 1996)

COUNTY Common Name	Scientific Name	Category
BEAVER		
Animals		
Spotted Frog	*Rana pretiosa*	C1
BOX ELDER		
Animals		
Fat-whorled Pondsnail	*Stagnicola bonnevillensis*	C1
Mountain Plover	*Charadrius montanus*	C1
CACHE		
no category 1 candidate species		
CARBON		
Plants		
Graham Beardtongue	*Penstemon grahamii*	C1
DAGGETT		
Animals		
Mountain Plover	*Charadrius montanus*	C1
DAVIS		
Animals		
Mountain Plover	*Charadrius montanus*	C1
DUCHESNE		
Animals		
Mountain Plover	*Charadrius montanus*	C1
Pariette Cactus	*Sclerocactus brevispinus*	C1
Plants		
Graham Beardtongue	*Penstemon grahamii*	C1
EMERY		
no category 1 candidate species		
GARFIELD		
Plants		
Aquarius Paintbrush	*Castilleja aquariensis*	C1

UTAH CANDIDATE SPECIES BY COUNTY

COUNTY Common Name	Scientific Name	Category
GRAND		
no category 1 candidate species		
IRON		
<u>Animals</u>		
Mountain Plover	*Charadrius montanus*	C1
JUAB		
<u>Animals</u>		
Spotted Frog	*Rana pretiosa*	C1
KANE		
<u>Animals</u>		
Coral Pink Sand Dunes Tiger Beetle	*Cincindela limbata albissima*	C1
MILLARD		
<u>Animals</u>		
Spotted Frog	*Rana pretiosa*	C1
MORGAN		
<u>Animals</u>		
Spotted Frog	*Rana pretiosa*	C1
PIUTE		
no category 1 candidate species		
RICH		
no category 1 candidate species		
SALT LAKE		
<u>Animals</u>		
Spotted Frog	*Rana pretiosa*	C1
SAN JUAN		
no category 1 candidate species		
SANPETE		
<u>Animals</u>		
Spotted Frog	*Rana pretiosa*	C1

UTAH CANDIDATE SPECIES BY COUNTY

COUNTY Common Name	Scientific Name	Category
SEVIER		
no category 1 candidate species		
SUMMIT		
Animals		
Mountain Plover	*Charadrius montanus*	C1
Spotted Frog	*Rana pretiosa*	C1
TOOELE		
Animals		
Mountain Plover	*Charadrius montanus*	C1
Spotted Frog	*Rana pretiosa*	C1
UINTAH		
Animals		
Mountain Plover	*Charadrius montanus*	C1
Plants		
Horseshoe Milkvetch	*Astragalus equisolensis*	C1
Graham Beardtongue	*Penstemon grahamii*	C1
White River Beardtongue	*Penstemon scariosus* var. *albifluvis*	C1
Pariette Cactus	*Sclerocactus brevispinus*	C1
UTAH		
Animals		
Spotted Frog	*Rana pretiosa*	C1
Plants		
Deseret Milkvetch	*Astragalus desereticus*	C1
WASATCH		
Animals		
Mountain Plover	*Charadrius montanus*	C1
Spotted Frog	*Rana pretiosa*	C1
WASHINGTON		
Animals		
Mountain Plover	*Charadrius montanus*	C1
Plants		
Holmgren Milkvetch	*Astragalus holmgreniorum*	C1
Shem Milkvetch	*Atragalus eremiticus ampullariodes*	C1

UTAH CANDIDATE SPECIES BY COUNTY

COUNTY Common Name	Scientific Name	Category
WAYNE		
Plants		
Aquarius Paintbrush	*Castilleja aquariensis*	C1
Rabbit Valley Gilia	*Gilia caespitosa*	C1
WEBER		
Animals		
Mountain Plover	*Charadrius montanus*	C1
Ogden Rocky Mountainsnail	*Oreohelix peripherica wasatchensis*	C1

Taxa that are possibly extinct are indicated by an asterisk (*).

Category Definitions

1 - Taxa for which the service has on file enough substantial information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species.

FEDERALLY LISTED AND PROPOSED (P) ENDANGERED (E) AND THREATENED (T) SPECIES IN UTAH
As of April 1996

Species	Scientific Name	Status
Plants		
Autumn Buttercup	*Ranunculus aestivalis*	E
Barneby Reed-mustard	*Schoenocrambe barnebyi*	E
Barneby Ridge-cress	*Lepidium barnebyanum*	E
Clay Phacelia	*Phacelia argillacea*	E
Clay Reed-mustard	*Schoenocrambe argillacea*	T
Dwarf-Bear Poppy	*Arctomecon humilis*	E
Heliotrope Milkvetch[4]	*Astragalus montii*	T
Jones Cycladenia	*Cycladenia humilis* var. *jonesii*	T
Kodachrome Bladderpod	*Lesquerella tumulosa*	E
Last Chance Townsendia	*Townsendia aprica*	T
Maguire Daisy[7]	*Erigeron maguirei*	E
Maguire Primrose	*Primula maguirei*	T
Navajo Sedge[4]	*Carex specuicola*	T
San Rafael Cactus	*Pediocactus despainii*	E
Shrubby Reed-mustard	*Schoenocrambe suffrutescens*	E
Siler Pincushion Cactus	*Pediocactus sileri*	T
Uinta Basin Hookless Cactus	*Sclerocactus glaucus*	T
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Welsh's Milkweed[4]	*Asclepias welshii*	T
Winkler Cactus	*Pediocactus winkleri*	PE
Wright Fishhook Cactus	*Sclerocactus wrightiae*	E
Mammals		
Black-footed Ferret[6]	*Mustela nigripes*	E
Utah Prairie Dog	*Cynomys parvidens*	T
Birds		
Bald Eagle[1,3]	*Haliaeetus leucocephalus*	T
Mexican Spotted Owl[1,4]	*Strix occidentalis lucida*	T
Peregrine Falcon[1]	*Falco peregrinus*	E
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	E
Whooping Crane[2]	*Grus americanus*	E
Fish		
Bonytail Chub[4]	*Gila elegans*	E
Colorado Squawfish[4]	*Ptychocheilus lucius*	E
Humpback Chub[4]	*Gila cypha*	E
June Sucker[4]	*Chasmistes liorus*	E
Lahontan Cutthroat Trout	*Oncorhynchus (=Salmo) clarki henshawi*	T

FEDERALLY LISTED AND PROPOSED (P) ENDANGERED (E) AND THREATENED (T) SPECIES IN UTAH
As of April 1996

Species	Scientific Name	Status
Least Chub	*Iotichthys plegethontis*	PE
Razorback Sucker[4]	*Xyrauchen texanus*	E
Virgin River Chub[5]	*Gila seminuda*	E
Woundfin[5]	*Plagopterus argentissimus*	E
Reptiles		
Desert Tortoise[4]	*Gopherus agassizii*	T
Snails		
Kanab Ambersnail[5]	*Oxyloma haydeni kanabensis*	E
Utah Valvata Snail[6]	*Valvata utahensis*	E

[1]Nests in Utah.

[2]Migrates through Utah, no resident populations.

[3]Wintering populations (three known nesting pairs in southeastern Utah).

[4]Critical habitat designated.

[5]Critical habitat proposed.

[6]Historical range.

[7]Proposed downlisting to threatened.

For additional information contact: U.S. Fish and Wildlife Service, 145 East 1300 South Suite 404, Salt Lake City, Utah 84115 Telephone: (801) 524-5001

United States Department of the Interior
FISH AND WILDLIFE SERVICE
UTAH FIELD OFFICE
LINCOLN PLAZA, SUITE #404
145 EAST 1300 SOUTH
SALT LAKE CITY, UTAH 84115

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DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

In Reply Refer To
(ES)

September 21, 1994

Memorandum

To: District Manager, Moab District, Bureau of Land Management, Moab, Utah

From: Assistant Field Supervisor, Utah Field Office, U.S. Fish & Wildlife Service, Salt Lake City, Utah

Subject: Endangered Species List for Price Coalbed Methane Project Environmental Impact Statement

We have reviewed your memorandum of August 29, 1994 concerning the subject project. It appears that listed endangered or threatened species, species proposed for listing, or designated critical habitat may occur in the area of influence of this action. To comply with Section 7(c) of the Endangered Species Act of 1973, as amended, Federal agencies or their designees are required to obtain from the U.S. Fish and Wildlife Service (Service) information concerning any species or critical habitat, listed or proposed to be listed, which may be present in the area of a proposed construction project. Therefore, we are furnishing you the following list of species which may be present in the concerned area:

Listed

bald eagle	*Haliaeetus leucocephalus*	E
black-footed ferret	*Mustela nigripes*	E
bonytail chub	*Gila elegans*	E
Colorado squawfish	*Ptychocheilus lucius*	E
humpback chub	*Gila cypha*	E
razorback sucker	*Xyrauchen texanus*	E

We would like to bring to your attention species which are candidates for official listing as threatened or endangered species (Federal Register Vol. 56, No. 255, November 21, 1991, and Vol. 58 No. 188, September 30, 1993). While these species have no legal protection at present under the Endangered Species Act, we would ask that you take care to avoid them if they are found in the area. In addition, some of these candidate species may be added to the endangered species list during your planning process. You should contact this office prior to putting your plan into final form to determine if any of these candidate species have been officially listed. Candidate species that may occur in the area of your project are as follows:

Candidate

canyon sweetvetch	*Hedysarum occidentale* var. *canone*	2
Creutzfeldt catseye	*Cryptantha creutzfeldtii*	2
ferruginous hawk	*Buteo regalis*	2
low hymenoxys	*Hymenoxys depressa*	2
northern goshawk	*Accipiter gentilis*	2
loggerhead shrike	*Lanius ludovicianus*	2
flannelmouth sucker	*Catostomus latipinnis*	2
roundtail chub	*Gila robusta*	2

Section 7(c) also requires the Federal agency proposing a major construction activity that significantly affects the quality of the human environment to conduct and submit to the Service a biological assessment to determine the effects of the proposal on listed and proposed species. The biological assessment shall be completed within 180 days after the date on which initiated or, a time mutually agreed upon between the agency and the Service. Before physical modification/alteration of a major Federal action is begun, the assessment must be completed. If the biological assessment is not begun within 90 days, this list should be verified with us prior to initiation of the assessment. We do not feel that we can adequately assess the affects of the proposed action on listed and proposed species or critical habitat and proposed critical habitat without a complete assessment.

When conducting a biological assessment, a thorough review of the project and the potential impacts of the project on threatened and endangered species within the immediate project area, as well as the area of influence, must be made.

After your agency has completed and reviewed the assessment, it is your responsibility to determine if the proposed action "may affect" any of the listed species or critical habitats. You should also determine if the action is likely to jeopardize the continued existence of proposed species or result in the destruction or an adverse modification of any critical habitat proposed for such species. If the determination is "may affect" for listed species, you must request in writing formal consultation from the Assistant Field Supervisor, Ecological Services, at the address given above. In addition, if you determine that the proposed action is likely to jeopardize the continued existence of proposed species or result in the destruction of adverse modification of proposed critical habitat, you must confer with the Service. At that time, you should provide this office a copy of the biological assessment and any other relevant information that assisted you in reaching its conclusion.

The Service can enter into formal Section 7 consultation only with another Federal agency. State, county or any other governmental or private organizations can participate in the consultation process, help prepare information such as the biological assessment, participate in meetings, etc.

Your attention is also directed to Section 7(d) of the Endangered Species Act, as amended, which underscores the requirement that the Federal agency or the applicant shall not make

any irreversible or irretrievable commitment of resources during the consultation period which, in effect, would deny the formulation or implementation of reasonable and prudent alternatives regarding their actions on any endangered or threatened species.

If we can be of further assistance, please advise us.

The Service representative who will provide you with technical assistance is Robert Benton; (801)524-5001.

APPENDIX 4A

SOIL LOSS, SEDIMENT PRODUCTION, AND SALT DELIVERY CALCULATIONS

Appendix 4A shows the methodology and assumptions used to calculate the estimated soil loss, sediment production and salt delivery rates used to assess impacts to the soils resource as presented in Section 4.4.

Soil Loss

The Revised Universal Soil Loss Equation (RUSLE) was used to calculate potential soil loss for each alternative and also formed the basis for estimating sediment and salt delivery. RUSLE is the standard equation developed to predict average annual soil loss by water erosion (Soil and Water Conservation Society 1995). Soil loss is determined from the product of six factors: rainfall, soil erodibility, the length and steepness of the ground slope, cover, and erosion control practices.

$$A = R \cdot K \cdot L \cdot S \cdot C \cdot P$$

where

A = soil loss in tons per acre per year

R = an erosivity factor related to rainfall intensity and runoff. Rainfall is based on data collected from the national weather service and is measured in inches per acre per hour per year. The value provided in the RUSLE database for the project area is 15.

K = the ease with which soil can be eroded is based on soil texture, organic-matter content, permeability and other soil characteristics. This data is provided in the soil survey for each soil series. Values range from 1.0 (most easily eroded) to 0.01 (almost non-erosive). For purposes of this evaluation, the highest K values of a selected sample of representative soils for each slope category (see "S" below) in the project area were used. K values of 0.32 to 0.49 were used for the calculations based on data provided in the soil surveys (USDA, SCS 1970, 1988).

L = average slope length was conservatively estimated to be 100 feet on slopes with angles of 10 percent or less, and 50 feet for all others. These estimates were based on the BLM environmental protection measure No. 21 (Section 2.2.5.1) that requires the construction of water bars on slopes greater than two percent.

S = average slope steepness values were obtained from topographic information in the GIS database for this project. Slopes in the project area range from 0 to 90 percent. Values of 10, 30, 50 and 70 percent were used and are, again, conservative averages since much of the area has slope angles less than 10 percent.

RUSLE evaluates the L and S factors together and modifies the value by factoring in a ratio of rill erosion to interill erosion (see "C" factor below).

C = average ground cover for the project area was estimated based on literature review, (USDI, BLM 1979; USDI, BLM 1988c; USDI, BLM 1993; USDA, SCS 1988) telephone consultation with a local range scientist (Jensen 1996), and knowledge of the site. Immediately after construction, upon initiation of reclamation ground cover would include mulch and rocks. Over time

the mulch would break down and vegetation would become reestablished. At five years after reclamation ground cover would include vegetative canopy, litter, and rock. The following values were used for the various subfactors of C.

- Ground cover
  Rock - 10-20 percent (all 3 cover scenarios)
  Mulch - 33 percent (mulched ground scenario assuming one-third of the disturbance area would be mulched)
  Litter - 10 percent (5-year reclamation scenario)
  Vegetation canopy - 25 percent (5 year reclamation scenario)

- Annual site production - 600 lb/acre was used for the 5-year reclamation scenario based on average production rates given in the soil survey (USDA, SCS 1988) for the ten most common range sites in the Project Area.

- Roughness value - 0.7 for cleared land for the bare ground and mulched ground scenarios, and 0.8 for desert grassland community for the 5-year reclamation scenario. These values are provided in the RUSLE database.

- Mechanical disturbance - The bareground scenario was assumed to have recent disturbance from heavy equipment. The other scenarios were not assumed to have been recently disturbed. The RUSLE database provides a "0 or 2" value based on the response to this yes or no question.

- Number of years needed for soil consolidation - The value used was 5 years based on the maximum time needed for successful revegetation.

- Erosion was assumed to be dominated by interill erosion which is the most conservative assumption available when calculating soil loss in RUSLE.

P = RUSLE computes the effect of erosion control practices, such as contouring and mulching, on the amount of soil loss. Values range up to 1.0; with no erosion control measures P = 1.0. The most conservative value of 1.0 was used for these calculations.

Values used for all factors except K were assumed to be consistent across the Project Area in order to simplify calculations, even though soil loss would not be equally distributed across the Project Area. The goal was to compare impacts of alternatives and to assess the overall significance of soil loss, sedimentation, and salt delivery to the Colorado River system. A total of 336 RUSLE equations were run to address 7 alternatives, 4 slope categories, 4 salinity values, and 3 ground cover scenarios (Tables 4A-1 through 4A-8). To keep the RUSLE calculations manageable, acres of disturbance were divided into four categories based on the slope angles noted above. A RUSLE calculation was run for each category and then these numbers summed to arrive at the total amount of soil loss for each alternative. Three different RUSLE calculations were run to estimate soil loss; (1) bare soil conditions - representing no mitigation measures or reclamation failure, (2) assuming disturbed areas would be covered with mulch - representative of early reclamation, and (3) assuming vegetation would be reestablished in 5 years - representative of

successful reclamation. Four salinity values were used to calculate salt yield (see below).

Each of the various types of disturbances in the Project Area were considered to determine which were most likely to result in increased erosion and which were not. Soils disturbed for the installation of pipelines/flowlines and electrical transmission lines would be the most susceptible to erosion. The acres of disturbance for these activities were used to calculate the amount of soil loss for each alternative. Along these ROWs, soils would be removed, the pipelines installed, and then the soil would be backfilled into the trenches and regraded as necessary. Temporary erosion control measures such as mulching may or may not be required depending on site specific characteristics of the area disturbed. Revegetation efforts would begin immediately; however, as noted in Section 4.5, it may take up to 5 years before it is fully established.

Erosion resulting from other construction and operation activities is not expected to be significant and these areas are not included in the RUSLE calculations. For example, typical well sites would be flat with a berm constructed around the perimeter, and high traffic areas would be covered with gravel. With this configuration, all runoff would be detained and sediment production from disturbed surfaces would be prevented. Injector well pads would be flat and would also have a gravel covering in high traffic areas. Storage ponds and evaporation ponds would not discharge any water or sediment, as all rainfall would be captured within the ponds. Additionally, all road surfaces would be covered with gravel; therefore, erosion would be prevented from these surfaces.

Sediment Delivery

Estimates of sediment yield to the Colorado River system were based on predictions made in the San Rafael Resource Management Plan (SRRMP)/Environmental Impact Statement prepared for the Moab District of the BLM (USDI, BLM 1988c). The area covered by the San Rafael study overlaps the southern one-fifth of the River Gas Project Area, and is also underlain by the Mancos Shale as is this project area. Thus, similar or identical soil types are common to the two areas. For purposes of this evaluation, it was assumed that the two areas have equivalent soil loss.

In the SRRMP, soil loss was estimated to be one to four times higher than the sediment delivery. These values were derived from sediment delivery field data collected on site. Therefore, to estimate sediment delivery for the River Gas Project Area, soil loss figures calculated in RUSLE were divided by 2.5, the average value determined in the San Rafael study.

Salt Loss and Salt Delivery

Salinity delivery rates were estimated as a direct percentage of the tons of soil loss and tons of sediment delivery respectively, and the percent of salt in the soils that would be impacted from project construction activities. Again, methods used and data provided in the SRRMP were used to estimate salinity yield rates for the River Gas Project Area. In the San Rafael study, salt percentage was measured in field studies for badland soils which were determined to be 3.5 percent salt. Then, using the electrical conductivity of badland soils (12 mmhos/cm), a simple ratio was used to derive the percent salt for other types of soil.

Very High

$$\frac{3.5\%}{12\ mmhos/cm} = \frac{x}{16\ mmhos/cm}$$

$$12x = 56;$$

$$x = 4.67\%$$

High

$$\frac{3.5\%}{12\ mmhos\ /\ cm} = \frac{x}{12\ mmhos\ /\ cm}$$

$12x = 42;$

$x = 3.50\%$

Moderate

$$\frac{3.5\%}{12\ mmhos\ /\ cm} = \frac{x}{6\ mmhos\ /\ cm}$$

$12x = 21;$

$x = 1.75\%$

Low

$$\frac{3.5\%}{12\ mmhos\ /\ cm} = \frac{x}{2\ mmhos\ /\ cm}$$

$12x = 7;$

$x = 0.58\%$

Electrical conductivity data are provided in the soil surveys for the project area for each soil series (see Appendix 3B). For purposes of this study, soil salinity levels were divided into four categories. The percent salt for each category was calculated using the average conductivity and the above equations.

Very high salinity- soils with electrical conductivity greater than 16 mmhos/cm	4.67%
High salinity - soils with electrical conductivity of 8-16 mmhos/cm	3.50%
Moderate salinity - soils with electrical conductivity of 4-8 mmhos/cm	1.75%
Low salinity - soils with electrical conductivity less than 4 mmhos/cm	0.58%

Salinity levels for each soil series were entered in the GIS database to determine acres of impacts for each salinity category for each alternative. Results are shown in Tables 4A-1 to 4A-8.

TABLE 4A-1

River Gas EIS

Soil Loss, Sediment Yield and Salinity Contributions

Slope Magnitude vs K and LS Factors					
				LS Factor	
Class	Acres	K	Slope Len	(bare grnd)	(w/ cover)
0-10% slopes	1,406	0.49	100	0.91	0.96
10-30% slopes	284	0.49	50	2.10	2.37
30-50% slopes	41	0.43	50	4.24	4.73
>50% slopes	11	0.32	50	5.97	6.63

RUSLE Parameters	
R Factor	15
K Factor	(as shown)
LS Factor	(as shown)
C Factor	(as shown)
P Factor =	1

Soil Salinity		
Class	% Dist Area (%)	% of Soil (%)
Very High=	6%	4.67%
High =	22%	3.50%
Moderate=	16%	1.75%
Low =	56%	0.58%

Proposed Action

Disturbed Ground Slope Magnitude (range)	K	Soil Salinity Content (class)	Disturbance Area (acres)		Soil Loss: Bare Ground (20% Cover)	Soil Loss: Mulched Ground (43% Cover)	Soil Loss: 5-year Reclamation (50% Cover)	Sediment Delivery: Bare Ground	Sediment Delivery: Mulched Ground	Sediment Delivery: 5-year Reclamation	Salt Loss: Bare Ground	Salt Loss: Mulched Ground	Salt Loss: 5-year Reclamation	Salt Delivery: Bare Ground	Salt Delivery: Mulched Ground	Salt Delivery: 5-year Reclamation
				C Factor =	1.92	0.251	0.075									
					(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
0-10%	0.49	Very High	84		1,083	149	45	433	60	18	50.6	7.0	2.1	20.2	2.8	0.8
0-10%	0.49	High	309		3,972	548	164	1,589	219	65	139.0	19.2	5.7	55.6	7.7	2.3
0-10%	0.49	Moderate	225		2,889	398	119	1,156	159	48	50.6	7.0	2.1	20.2	2.8	0.8
0-10%	0.49	Low	787		10,111	1,394	417	4,044	558	167	58.6	8.1	2.4	23.5	3.2	1.0
			1406	*Subtotals >*	*18,056*	*2,490*	*744*	*7,222*	*996*	*298*	*298.8*	*41.2*	*12.3*	*119.5*	*16.5*	*4.9*
				Soil Loss (tons/ac/yr) =	*12.8*	*1.8*	*0.5*									
10-30%	0.49	Very High	17		505	75	22	202	30	9	23.6	3.5	1.0	9.4	1.4	0.4
10-30%	0.49	High	62		1,852	273	82	741	109	33	64.8	9.6	2.9	25.9	3.8	1.1
10-30%	0.49	Moderate	45		1,347	199	59	539	79	24	23.6	3.5	1.0	9.4	1.4	0.4
10-30%	0.49	Low	159		4,713	695	208	1,885	278	83	27.3	4.0	1.2	10.9	1.6	0.5
			284	*Subtotals >*	*8,416*	*1,242*	*371*	*3,367*	*497*	*148*	*139.3*	*20.6*	*6.1*	*55.7*	*8.2*	*2.5*
				Soil Loss (tons/ac/yr) =	*29.6*	*4.4*	*1.3*									
30-50%	0.43	Very High	2		129	19	6	52	8	2	6.0	0.9	0.3	2.4	0.4	0.1
30-50%	0.43	High	9		474	69	21	189	28	8	16.6	2.4	0.7	6.6	1.0	0.3
30-50%	0.43	Moderate	7		344	50	15	138	20	6	6.0	0.9	0.3	2.4	0.4	0.1
30-50%	0.43	Low	23		1,206	176	53	482	70	21	7.0	1.0	0.3	2.8	0.4	0.1
			41	*Subtotals >*	*2,153*	*314*	*94*	*861*	*126*	*38*	*35.6*	*5.2*	*1.6*	*14.3*	*2.1*	*0.6*
				Soil Loss (tons/ac/yr) =	*52.5*	*7.7*	*2.3*									
>50%	0.32	Very High	1		36	5	2	15	2	1	1.7	0.2	0.1	0.7	0.1	0.0
>50%	0.32	High	2		133	19	6	53	8	2	4.7	0.7	0.2	1.9	0.3	0.1
>50%	0.32	Moderate	2		97	14	4	39	6	2	1.7	0.2	0.1	0.7	0.1	0.0
>50%	0.32	Low	6		339	49	15	136	20	6	2.0	0.3	0.1	0.8	0.1	0.0
			11	*Subtotals >*	*605*	*88*	*26*	*242*	*35*	*10*	*10.0*	*1.5*	*0.4*	*4.0*	*0.6*	*0.2*
				Soil Loss (tons/ac/yr) =	*55.0*	*8.0*	*2.4*									
TOTALS			*1,742*	*TOTALS>*	*29,230*	*4,134*	*1,235*	*11,692*	*1,653*	*494*	*484*	*68*	*20*	*194*	*27*	*8*
				Soil Loss (tons/ac/yr) =	*16.8*	*2.4*	*0.7*	*6.7*	*0.9*	*0.3*	*0.3*	*0.04*	*0.01*	*0.1*	*0.02*	*0.005*

TABLE 4A-2

River Gas EIS
Soil Loss, Sediment Yield and Salinity Contributions

Slope Magnitude vs K and LS Factors				LS Factor	
Class	Acres	K	Slope Len	(bare grnd)	(w/ cover)
0-10% slopes	1,754	0.49	100	0.91	0.96
10-30% slopes	355	0.49	50	2.10	2.37
30-50% slopes	50	0.43	50	4.24	4.73
>50% slopes	14	0.32	50	5.97	6.63

RUSLE Parameters	
R Factor	15
K Factor	(as shown)
LS Factor	(as shown)
C Factor	(as shown)
P Factor =	1

Soil Salinity		
Class	% Dist Area	% of Soil
	(%)	(%)
Very High=	6%	4.67%
High =	26%	3.50%
Moderate=	14%	1.75%
Low =	54%	0.58%

Alternative A

Disturbed Ground Slope Magnitude (range)	K	Soil Salinity Content (class)	Disrubance Area (acres)		Soil Loss: Bare Ground (20% Cover)	Soil Loss: Mulched Ground (43% Cover)	Soil Loss: 5-year Reclamation (50% Cover)	Sediment Delivery: Bare Ground	Sediment Delivery: Mulched Ground	Sediment Delivery: 5-year Reclamation	Salt Loss: Bare Ground	Salt Loss: Mulched Ground	Salt Loss: 5-year Reclamation	Salt Delivery: Bare Ground	Salt Delivery: Mulched Ground	Salt Delivery: 5-year Reclamation
				C Factor =	1.92	0.251	0.075									
					(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
0-10%	0.49	Very High	105		1,351	186	56	541	75	22	63.1	8.7	2.6	25.2	3.5	1.0
0-10%	0.49	High	456		5,856	808	241	2,343	323	97	205.0	28.3	8.4	82.0	11.3	3.4
0-10%	0.49	Moderate	246		3,153	435	130	1,261	174	52	55.2	7.6	2.3	22.1	3.0	0.9
0-10%	0.49	Low	947		12,163	1,677	501	4,865	671	200	70.5	9.7	2.9	28.2	3.9	1.2
			1754	*Subtotals >*	*22,525*	*3,106*	*928*	*9,010*	*1243*	*371*	*393.8*	*54.3*	*16.2*	*157.5*	*21.7*	*6.5*
				Soil Loss (tons/ac/yr) =	*12.8*	*1.8*	*0.5*									
10-30%	0.49	Very High	21		631	93	28	252	37	11	29.5	4.3	1.3	11.8	1.7	0.5
10-30%	0.49	High	92		2,735	404	121	1,094	161	48	95.7	14.1	4.2	38.3	5.6	1.7
10-30%	0.49	Moderate	50		1,473	217	65	589	87	26	25.8	3.8	1.1	10.3	1.5	0.5
10-30%	0.49	Low	192		5,681	838	250	2,272	335	100	33.0	4.9	1.5	13.2	1.9	0.6
			355	*Subtotals >*	*10,520*	*1,552*	*464*	*4,208*	*621*	*186*	*183.9*	*27.1*	*8.1*	*73.6*	*10.9*	*3.2*
				Soil Loss (tons/ac/yr) =	*29.6*	*4.4*	*1.3*									
30-50%	0.43	Very High	3		158	23	7	63	9	3	7.4	1.1	0.3	2.9	0.4	0.1
30-50%	0.43	High	13		683	100	30	273	40	12	23.9	3.5	1.0	9.6	1.4	0.4
30-50%	0.43	Moderate	7		368	54	16	147	21	6	6.4	0.9	0.3	2.6	0.4	0.1
30-50%	0.43	Low	27		1,418	207	62	567	83	25	8.2	1.2	0.4	3.3	0.5	0.1
			50	*Subtotals >*	*2,625*	*383*	*114*	*1,050*	*153*	*46*	*45.9*	*6.7*	*2.0*	*18.4*	*2.7*	*0.8*
				Soil Loss (tons/ac/yr) =	*52.5*	*7.7*	*2.3*									
>50%	0.32	Very High	1		46	7	2	18	3	1	2.2	0.3	0.1	0.9	0.1	0.0
>50%	0.32	High	4		200	29	9	80	12	3	7.0	1.0	0.3	2.8	0.4	0.1
>50%	0.32	Moderate	2		108	16	5	43	6	2	1.9	0.3	0.1	0.8	0.1	0.0
>50%	0.32	Low	8		416	60	18	166	24	7	2.4	0.4	0.1	1.0	0.1	0.0
			14	*Subtotals >*	*770*	*112*	*33*	*308*	*45*	*13*	*13.5*	*2.0*	*0.6*	*5.4*	*0.8*	*0.2*
				Soil Loss (tons/ac/yr) =	*55.0*	*8.0*	*2.4*									
TOTALS			*2,173*	*TOTALS>*	*36,441*	*5,153*	*1,540*	*14,576*	*2,061*	*616*	*637*	*90*	*27*	*255*	*36*	*11*
				Soil Loss (tons/ac/yr) =	*16.8*	*2.4*	*0.7*	*6.7*	*0.9*	*0.3*	*0.3*	*0.04*	*0.01*	*0.1*	*0.02*	*0.005*

TABLE 4A-3

River Gas EIS
Soil Loss, Sediment Yield and Salinity Contributions

Slope Magnitude vs K and LS Factors				LS Factor	
Class	Acres	K	Slope Len	(bare grnd)	(w/ cover)
0-10% slopes	1,076	0.49	100	0.91	0.96
10-30% slopes	218	0.49	50	2.10	2.37
30-50% slopes	31	0.43	50	4.24	4.73
>50% slopes	8	0.32	50	5.97	6.63

RUSLE Parameters	
R Factor	15
K Factor	(as shown)
LS Factor	(as shown)
C Factor	(as shown)
P Factor =	1

Soil Salinity		
Class	% Dist Area (%)	% of Soil (%)
Very High=	8%	4.67%
High =	28%	3.50%
Moderate=	12%	1.75%
Low =	52%	0.58%

Alternative B1

Disturbed Ground Slope Magnitude (range)	K	Soil Salinity Content (class)	Distrubance Area (acres)	C Factor =	Soil Loss: Bare Ground (20% Cover) 1.92 (tons/yr)	Soil Loss: Mulched Ground (43% Cover) 0.251 (tons/yr)	Soil Loss: 5-year Reclamation (50% Cover) 0.075 (tons/yr)	Sediment Delivery: Bare Ground (tons/yr)	Sediment Delivery: Mulched Ground (tons/yr)	Sediment Delivery: 5-year Reclamation (tons/yr)	Salt Loss: Bare Ground (tons/yr)	Salt Loss: Mulched Ground (tons/yr)	Salt Loss: 5-year Reclamation (tons/yr)	Salt Delivery: Bare Ground (tons/yr)	Salt Delivery: Mulched Ground (tons/yr)	Salt Delivery: 5-year Reclamation (tons/yr)
0-10%	0.49	Very High	86		1,105	152	46	442	61	18	51.6	7.1	2.1	20.6	2.8	0.9
0-10%	0.49	High	301		3,869	534	159	1,548	213	64	135.4	18.7	5.6	54.2	7.5	2.2
0-10%	0.49	Moderate	129		1,658	229	68	663	91	27	29.0	4.0	1.2	11.6	1.6	0.5
0-10%	0.49	Low	560		7,185	991	296	2,874	396	118	41.7	5.7	1.7	16.7	2.3	0.7
			1076	*Subtotals >*	*13,818*	*1,906*	*569*	*5,527*	*762*	*228*	*257.7*	*35.5*	*10.6*	*103.1*	*14.2*	*4.2*
				Soil Loss (tons/ac/yr) =	*12.8*	*1.8*	*0.5*									
10-30%	0.49	Very High	17		517	76	23	207	31	9	24.1	3.6	1.1	9.7	1.4	0.4
10-30%	0.49	High	61		1,809	267	80	724	107	32	63.3	9.3	2.8	25.3	3.7	1.1
10-30%	0.49	Moderate	26		775	114	34	310	46	14	13.6	2.0	0.6	5.4	0.8	0.2
10-30%	0.49	Low	113		3,359	496	148	1,344	198	59	19.5	2.9	0.9	7.8	1.1	0.3
			218	*Subtotals >*	*6,460*	*953*	*285*	*2,584*	*381*	*114*	*120.5*	*17.8*	*5.3*	*48.2*	*7.1*	*2.1*
				Soil Loss (tons/ac/yr) =	*29.6*	*4.4*	*1.3*									
30-50%	0.43	Very High	2		130	19	6	52	8	2	6.1	0.9	0.3	2.4	0.4	0.1
30-50%	0.43	High	9		456	66	20	182	27	8	16.0	2.3	0.7	6.4	0.9	0.3
30-50%	0.43	Moderate	4		195	28	9	78	11	3	3.4	0.5	0.1	1.4	0.2	0.1
30-50%	0.43	Low	16		846	123	37	339	49	15	4.9	0.7	0.2	2.0	0.3	0.1
			31	*Subtotals >*	*1,628*	*237*	*71*	*651*	*95*	*28*	*30.4*	*4.4*	*1.3*	*12.1*	*1.8*	*0.5*
				Soil Loss (tons/ac/yr) =	*52.5*	*7.7*	*2.3*									
>50%	0.32	Very High	1		35	5	2	14	2	1	1.6	0.2	0.1	0.7	0.1	0.0
>50%	0.32	High	2		123	18	5	49	7	2	4.3	0.6	0.2	1.7	0.3	0.1
>50%	0.32	Moderate	1		53	8	2	21	3	1	0.9	0.1	0.0	0.4	0.1	0.0
>50%	0.32	Low	4		229	33	10	92	13	4	1.3	0.2	0.1	0.5	0.1	0.0
			8	*Subtotals >*	*440*	*64*	*19*	*176*	*26*	*8*	*8.2*	*1.2*	*0.4*	*3.3*	*0.5*	*0.1*
				Soil Loss (tons/ac/yr) =	*55.0*	*8.0*	*2.4*									
TOTALS			*1,333*	*TOTALS>*	*22,346*	*3,160*	*944*	*8,939*	*1,264*	*378*	*417*	*59*	*18*	*167*	*24*	*7*
				Soil Loss (tons/ac/yr) =	*16.8*	*2.4*	*0.7*	*6.7*	*0.9*	*0.3*	*0.3*	*0.04*	*0.01*	*0.1*	*0.02*	*0.005*

TABLE 4A-4

River Gas EIS
Soil Loss, Sediment Yield and Salinity Contributions

Slope Magnitude vs K and LS Factors					
				LS Factor	
Class	Acres	K	Slope Len	(bare grnd)	(w/ cover)
0-10% slopes	1,401	0.49	100	0.91	0.96
10-30% slopes	283	0.49	50	2.10	2.37
30-50% slopes	40	0.43	50	4.24	4.73
>50% slopes	11	0.32	50	5.97	6.63

RUSLE Parameters	
R Factor	15
K Factor	(as shown)
LS Factor	(as shown)
C Factor	(as shown)
P Factor =	1

Soil Salinity		
Class	% Dist Area (%)	% of Soil (%)
Very High=	8%	4.67%
High =	32%	3.50%
Moderate=	11%	1.75%
Low =	49%	0.58%

Alternative B2

Disturbed Ground Slope Magnitude (range)	K	Soil Salinity Content (class)	Distrubance Area (acres)		Soil Loss: Bare Ground (20% Cover)	Soil Loss: Mulched Ground (43% Cover)	Soil Loss: 5-year Reclamation (50% Cover)	Sediment Delivery: Bare Ground	Sediment Delivery: Mulched Ground	Sediment Delivery: 5-year Reclamation	Salt Loss: Bare Ground	Salt Loss: Mulched Ground	Salt Loss: 5-year Reclamation	Salt Delivery: Bare Ground	Salt Delivery: Mulched Ground	Salt Delivery: 5-year Reclamation
				C Factor =	1.92	0.251	0.075									
					(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
0-10%	0.49	Very High	112		1,439	198	59	576	79	24	67.2	9.3	2.8	26.9	3.7	1.1
0-10%	0.49	High	448		5,757	794	237	2,303	318	95	201.5	27.8	8.3	80.6	11.1	3.3
0-10%	0.49	Moderate	154		1,979	273	82	792	109	33	34.6	4.8	1.4	13.9	1.9	0.6
0-10%	0.49	Low	686		8,816	1,216	363	3,526	486	145	51.1	7.1	2.1	20.5	2.8	0.8
			1401	*Subtotals >*	*17,992*	*2,481*	*741*	*7,197*	*992*	*297*	*354.5*	*48.9*	*14.6*	*141.8*	*19.6*	*5.8*
				Soil Loss (tons/ac/yr) =	*12.8*	*1.8*	*0.5*									
10-30%	0.49	Very High	23		671	99	30	268	40	12	31.3	4.6	1.4	12.5	1.8	0.6
10-30%	0.49	High	91		2,684	396	118	1,074	158	47	93.9	13.9	4.1	37.6	5.5	1.7
10-30%	0.49	Moderate	31		923	136	41	369	54	16	16.1	2.4	0.7	6.5	1.0	0.3
10-30%	0.49	Low	139		4,110	606	181	1,644	243	72	23.8	3.5	1.1	9.5	1.4	0.4
			283	*Subtotals >*	*8,387*	*1,237*	*370*	*3,355*	*495*	*148*	*165.2*	*24.4*	*7.3*	*66.1*	*9.8*	*2.9*
				Soil Loss (tons/ac/yr) =	*29.6*	*4.4*	*1.3*									
30-50%	0.43	Very High	3		168	24	7	67	10	3	7.8	1.1	0.3	3.1	0.5	0.1
30-50%	0.43	High	13		672	98	29	269	39	12	23.5	3.4	1.0	9.4	1.4	0.4
30-50%	0.43	Moderate	4		231	34	10	92	13	4	4.0	0.6	0.2	1.6	0.2	0.1
30-50%	0.43	Low	20		1,029	150	45	412	60	18	6.0	0.9	0.3	2.4	0.3	0.1
			40	*Subtotals >*	*2,100*	*306*	*92*	*840*	*122*	*37*	*41.4*	*6.0*	*1.8*	*16.6*	*2.4*	*0.7*
				Soil Loss (tons/ac/yr) =	*52.5*	*7.7*	*2.3*									
>50%	0.32	Very High	1		48	7	2	19	3	1	2.3	0.3	0.1	0.9	0.1	0.0
>50%	0.32	High	4		194	28	8	77	11	3	6.8	1.0	0.3	2.7	0.4	0.1
>50%	0.32	Moderate	1		67	10	3	27	4	1	1.2	0.2	0.1	0.5	0.1	0.0
>50%	0.32	Low	5		297	43	13	119	17	5	1.7	0.2	0.1	0.7	0.1	0.0
			11	*Subtotals >*	*605*	*88*	*26*	*242*	*35*	*10*	*11.9*	*1.7*	*0.5*	*4.8*	*0.7*	*0.2*
				Soil Loss (tons/ac/yr) =	*55.0*	*8.0*	*2.4*									
TOTALS			*1,735*	*TOTALS>*	*29,084*	*4,113*	*1,229*	*11,634*	*1,645*	*492*	*573*	*81*	*24*	*229*	*32*	*10*
				Soil Loss (tons/ac/yr) =	*16.8*	*2.4*	*0.7*	*6.7*	*0.9*	*0.3*	*0.3*	*0.05*	*0.01*	*0.1*	*0.02*	*0.006*

TABLE 4A-5

River Gas EIS
Soil Loss, Sediment Yield and Salinity Contributions

Slope Magnitude vs K and LS Factors					
				LS Factor	
Class	Acres	K	Slope Len	(bare grnd)	(w/ cover)
0-10% slopes	1,298	0.49	100	0.91	0.96
10-30% slopes	263	0.49	50	2.10	2.37
30-50% slopes	37	0.43	50	4.24	4.73
>50% slopes	10	0.32	50	5.97	6.63

RUSLE Parameters	
R Factor	15
K Factor	(as shown)
LS Factor	(as shown)
C Factor	(as shown)
P Factor =	1

Soil Salinity		
Class	% Dist Area (%)	% of Soil (%)
Very High=	7%	4.67%
High =	24%	3.50%
Moderate=	16%	1.75%
Low =	53%	0.58%

Alternative C1

Disturbed Ground Slope Magnitude (range)	K	Soil Salinity Content (class)	Distrubance Area (acres)		Soil Loss: Bare Ground (20% Cover)	Soil Loss: Mulched Ground (43% Cover)	Soil Loss: 5-year Reclamation (50% Cover)	Sediment Delivery: Bare Ground	Sediment Delivery: Mulched Ground	Sediment Delivery: 5-year Reclamation	Salt Loss: Bare Ground	Salt Loss: Mulched Ground	Salt Loss: 5-year Reclamation	Salt Delivery: Bare Ground	Salt Delivery: Mulched Ground	Salt Delivery: 5-year Reclamation
				C Factor =	1.92	0.251	0.075									
					(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
0-10%	0.49	Very High	91		1,167	161	48	467	64	19	54.5	7.5	2.2	21.8	3.0	0.9
0-10%	0.49	High	312		4,001	552	165	1,600	221	66	140.0	19.3	5.8	56.0	7.7	2.3
0-10%	0.49	Moderate	208		2,667	368	110	1,067	147	44	46.7	6.4	1.9	18.7	2.6	0.8
0-10%	0.49	Low	688		8,834	1,218	364	3,534	487	146	51.2	7.1	2.1	20.5	2.8	0.8
			1298	*Subtotals >*	*16,669*	*2,299*	*687*	*6,668*	*920*	*275*	*292.4*	*40.3*	*12.1*	*117.0*	*16.1*	*4.8*
				Soil Loss (tons/ac/yr) =	*12.8*	*1.8*	*0.5*									
10-30%	0.49	Very High	18		546	80	24	218	32	10	25.5	3.8	1.1	10.2	1.5	0.4
10-30%	0.49	High	63		1,871	276	82	748	110	33	65.5	9.7	2.9	26.2	3.9	1.2
10-30%	0.49	Moderate	42		1,247	184	55	499	74	22	21.8	3.2	1.0	8.7	1.3	0.4
10-30%	0.49	Low	139		4,131	609	182	1,652	244	73	24.0	3.5	1.1	9.6	1.4	0.4
			263	*Subtotals >*	*7,794*	*1,150*	*344*	*3,118*	*460*	*137*	*136.7*	*20.2*	*6.0*	*54.7*	*8.1*	*2.4*
				Soil Loss (tons/ac/yr) =	*29.6*	*4.4*	*1.3*									
30-50%	0.43	Very High	3		136	20	6	54	8	2	6.4	0.9	0.3	2.5	0.4	0.1
30-50%	0.43	High	9		466	68	20	187	27	8	16.3	2.4	0.7	6.5	1.0	0.3
30-50%	0.43	Moderate	6		311	45	14	124	18	5	5.4	0.8	0.2	2.2	0.3	0.1
30-50%	0.43	Low	20		1,030	150	45	412	60	18	6.0	0.9	0.3	2.4	0.3	0.1
			37	*Subtotals >*	*1,943*	*283*	*85*	*777*	*113*	*34*	*34.1*	*5.0*	*1.5*	*13.6*	*2.0*	*0.6*
				Soil Loss (tons/ac/yr) =	*52.5*	*7.7*	*2.3*									
>50%	0.32	Very High	1		39	6	2	15	2	1	1.8	0.3	0.1	0.7	0.1	0.0
>50%	0.32	High	2		132	19	6	53	8	2	4.6	0.7	0.2	1.8	0.3	0.1
>50%	0.32	Moderate	2		88	13	4	35	5	2	1.5	0.2	0.1	0.6	0.1	0.0
>50%	0.32	Low	5		292	42	13	117	17	5	1.7	0.2	0.1	0.7	0.1	0.0
			10	*Subtotals >*	*550*	*80*	*24*	*220*	*32*	*10*	*9.7*	*1.4*	*0.4*	*3.9*	*0.6*	*0.2*
				Soil Loss (tons/ac/yr) =	*55.0*	*8.0*	*2.4*									
TOTALS			*1,608*	*TOTALS>*	*26,956*	*3,812*	*1,139*	*10,782*	*1,525*	*456*	*473*	*67*	*20*	*189*	*27*	*8*
				Soil Loss (tons/ac/yr) =	*16.8*	*2.4*	*0.7*	*6.7*	*0.9*	*0.3*	*0.3*	*0.04*	*0.01*	*0.1*	*0.02*	*0.005*

TABLE 4A-6

River Gas EIS
Soil Loss, Sediment Yield and Salinity Contributions

Slope Magnitude vs K and LS Factors				LS Factor	
Class	Acres	K	Slope Len	(bare grnd)	(w/ cover)
0-10% slopes	1,624	0.49	100	0.91	0.96
10-30% slopes	328	0.49	50	2.10	2.37
30-50% slopes	47	0.43	50	4.24	4.73
>50% slopes	13	0.32	50	5.97	6.63

RUSLE Parameters	
R Factor	15
K Factor	(as shown)
LS Factor	(as shown)
C Factor	(as shown)
P Factor =	1

Soil Salinity		
Class	% Dist Area	% of Soil
	(%)	(%)
Very High=	7%	4.67%
High =	28%	3.50%
Moderate=	14%	1.75%
Low =	51%	0.58%

Alternative C2

Disturbed Ground Slope Magnitude (range)	K	Soil Salinity Content (class)	Disturbance Area (acres)	C Factor =	Soil Loss Bare Ground (20% Cover) 1.92 (tons/yr)	Soil Loss Mulched Ground (43% Cover) 0.251 (tons/yr)	Soil Loss 5-year Reclamation (50% Cover) 0.075 (tons/yr)	Sediment Delivery Bare Ground (tons/yr)	Sediment Delivery Mulched Ground (tons/yr)	Sediment Delivery 5-year Reclamation (tons/yr)	Salt Loss Bare Ground (tons/yr)	Salt Loss Mulched Ground (tons/yr)	Salt Loss 5-year Reclamation (tons/yr)	Salt Delivery Bare Ground (tons/yr)	Salt Delivery Mulched Ground (tons/yr)	Salt Delivery 5-year Reclamation (tons/yr)
0-10%	0.49	Very High	114		1,460	201	60	584	81	24	68.2	9.4	2.8	27.3	3.8	1.1
0-10%	0.49	High	455		5,839	805	241	2,336	322	96	204.4	28.2	8.4	81.8	11.3	3.4
0-10%	0.49	Moderate	227		2,920	403	120	1,168	161	48	51.1	7.0	2.1	20.4	2.8	0.8
0-10%	0.49	Low	828		10,636	1,467	438	4,254	587	175	61.7	8.5	2.5	24.7	3.4	1.0
			1624	*Subtotals >*	*20,855*	*2,876*	*859*	*8,342*	*1150*	*344*	*385.3*	*53.1*	*15.9*	*154.1*	*21.3*	*6.4*
				Soil Loss (tons/ac/yr) =	*12.8*	*1.8*	*0.5*									
10-30%	0.49	Very High	23		680	100	30	272	40	12	31.8	4.7	1.4	12.7	1.9	0.6
10-30%	0.49	High	92		2,722	402	120	1,089	161	48	95.3	14.1	4.2	38.1	5.6	1.7
10-30%	0.49	Moderate	46		1,361	201	60	544	80	24	23.8	3.5	1.0	9.5	1.4	0.4
10-30%	0.49	Low	167		4,957	731	219	1,983	293	87	28.8	4.2	1.3	11.5	1.7	0.5
			328	*Subtotals >*	*9,720*	*1,434*	*429*	*3,888*	*574*	*171*	*179.6*	*26.5*	*7.9*	*71.8*	*10.6*	*3.2*
				Soil Loss (tons/ac/yr) =	*29.6*	*4.4*	*1.3*									
30-50%	0.43	Very High	3		173	25	8	69	10	3	8.1	1.2	0.4	3.2	0.5	0.1
30-50%	0.43	High	13		691	101	30	276	40	12	24.2	3.5	1.1	9.7	1.4	0.4
30-50%	0.43	Moderate	7		346	50	15	138	20	6	6.0	0.9	0.3	2.4	0.4	0.1
30-50%	0.43	Low	24		1,259	184	55	503	73	22	7.3	1.1	0.3	2.9	0.4	0.1
			47	*Subtotals >*	*2,468*	*360*	*108*	*987*	*144*	*43*	*45.6*	*6.6*	*2.0*	*18.2*	*2.7*	*0.8*
				Soil Loss (tons/ac/yr) =	*52.5*	*7.7*	*2.3*									
>50%	0.32	Very High	1		50	7	2	20	3	1	2.3	0.3	0.1	0.9	0.1	0.0
>50%	0.32	High	4		200	29	9	80	12	3	7.0	1.0	0.3	2.8	0.4	0.1
>50%	0.32	Moderate	2		100	15	4	40	6	2	1.8	0.3	0.1	0.7	0.1	0.0
>50%	0.32	Low	7		365	53	16	146	21	6	2.1	0.3	0.1	0.8	0.1	0.0
			13	*Subtotals >*	*715*	*104*	*31*	*286*	*42*	*12*	*13.2*	*1.9*	*0.6*	*5.3*	*0.8*	*0.2*
				Soil Loss (tons/ac/yr) =	*55.0*	*8.0*	*2.4*									
TOTALS			*2,012*	*TOTALS>*	*33,759*	*4,774*	*1,426*	*13,504*	*1,910*	*571*	*624*	*88*	*26*	*250*	*35*	*11*
				Soil Loss (tons/ac/yr) =	*16.8*	*2.4*	*0.7*	*6.7*	*0.9*	*0.3*	*0.3*	*0.04*	*0.01*	*0.1*	*0.02*	*0.005*

TABLE 4A-7

River Gas EIS
Soil Loss, Sediment Yield and Salinity Contributions

No Action Alternative

Slope Magnitude vs K and LS Factors				LS Factor (bare grnd)	LS Factor (w/ cover)
Class	Acres	K	Slope Len	(bare grnd)	(w/ cover)
0-10% slopes	692	0.49	100	0.91	0.96
10-30% slopes	140	0.49	50	2.10	2.37
30-50% slopes	20	0.43	50	4.24	4.73
>50% slopes	5	0.32	50	5.97	6.63

RUSLE Parameters	
R Factor	15
K Factor	(as shown)
LS Factor	(as shown)
C Factor	(as shown)
P Factor =	1

Soil Salinity		
Class	% Dist Area (%)	% of Soil (%)
Very High=	8%	4.67%
High =	27%	3.50%
Moderate=	14%	1.75%
Low =	51%	0.58%

Disturbed Ground Slope Magnitude (range)	K	Soil Salinity Content (class)	Disturbance Area (acres)		Soil Loss: Bare Ground (20% Cover)	Soil Loss: Mulched Ground (43% Cover)	Soil Loss: 5-year Reclamation (50% Cover)	Sediment Delivery: Bare Ground	Sediment Delivery: Mulched Ground	Sediment Delivery: 5-year Reclamation	Salt Loss: Bare Ground	Salt Loss: Mulched Ground	Salt Loss: 5-year Reclamation	Salt Delivery: Bare Ground	Salt Delivery: Mulched Ground	Salt Delivery: 5-year Reclamation
				C Factor =	1.92	0.251	0.075									
					(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
0-10%	0.49	Very High	55		711	98	29	284	39	12	33.2	4.6	1.4	13.3	1.8	0.5
0-10%	0.49	High	187		2,399	331	99	960	132	40	84.0	11.6	3.5	33.6	4.6	1.4
0-10%	0.49	Moderate	97		1,244	172	51	498	69	21	21.8	3.0	0.9	8.7	1.2	0.4
0-10%	0.49	Low	353		4,532	625	187	1,813	250	75	26.3	3.6	1.1	10.5	1.5	0.4
			692	*Subtotals >*	*8,887*	*1,226*	*366*	*3,555*	*490*	*146*	*165.2*	*22.8*	*6.8*	*66.1*	*9.1*	*2.7*
				Soil Loss (tons/ac/yr) =	*12.8*	*1.8*	*0.5*									
10-30%	0.49	Very High	11		332	49	15	133	20	6	15.5	2.3	0.7	6.2	0.9	0.3
10-30%	0.49	High	38		1,120	165	49	448	66	20	39.2	5.8	1.7	15.7	2.3	0.7
10-30%	0.49	Moderate	20		581	86	26	232	34	10	10.2	1.5	0.4	4.1	0.6	0.2
10-30%	0.49	Low	71		2,116	312	93	846	125	37	12.3	1.8	0.5	4.9	0.7	0.2
			140	*Subtotals >*	*4,149*	*612*	*183*	*1,660*	*245*	*73*	*77.1*	*11.4*	*3.4*	*30.9*	*4.6*	*1.4*
				Soil Loss (tons/ac/yr) =	*29.6*	*4.4*	*1.3*									
30-50%	0.43	Very High	2		84	12	4	34	5	1	3.9	0.6	0.2	1.6	0.2	0.1
30-50%	0.43	High	5		284	41	12	113	17	5	9.9	1.4	0.4	4.0	0.6	0.2
30-50%	0.43	Moderate	3		147	21	6	59	9	3	2.6	0.4	0.1	1.0	0.2	0.0
30-50%	0.43	Low	10		536	78	23	214	31	9	3.1	0.5	0.1	1.2	0.2	0.1
			20	*Subtotals >*	*1,050*	*153*	*46*	*420*	*61*	*18*	*19.5*	*2.8*	*0.9*	*7.8*	*1.1*	*0.3*
				Soil Loss (tons/ac/yr) =	*52.5*	*7.7*	*2.3*									
>50%	0.32	Very High	0		22	3	1	9	1	0	1.0	0.1	0.0	0.4	0.1	0.0
>50%	0.32	High	1		74	11	3	30	4	1	2.6	0.4	0.1	1.0	0.2	0.0
>50%	0.32	Moderate	1		39	6	2	15	2	1	0.7	0.1	0.0	0.3	0.0	0.0
>50%	0.32	Low	3		140	20	6	56	8	2	0.8	0.1	0.0	0.3	0.0	0.0
			5	*Subtotals >*	*275*	*40*	*12*	*110*	*16*	*5*	*5.1*	*0.7*	*0.2*	*2.0*	*0.3*	*0.1*
				Soil Loss (tons/ac/yr) =	*55.0*	*8.0*	*2.4*									
TOTALS			*857*	*TOTALS>*	*14,361*	*2,031*	*607*	*5,744*	*812*	*243*	*267*	*38*	*11*	*107*	*15*	*5*
				Soil Loss (tons/ac/yr) =	*16.8*	*2.4*	*0.7*	*6.7*	*0.9*	*0.3*	*0.3*	*0.04*	*0.01*	*0.1*	*0.02*	*0.005*

TABLE 4A-8

Summary - Soil Loss, Sediment Delivery, Salinity Loss, and Salt Delivery

Alternatives	Soil Loss (tons/yr)			Sediment Delivery (tons/yr)			Salinity Loss (tons/yr)			Salt Delivery (tons/yr)		
	Bare Ground	Mulched Ground	5-year Reclamation	Bare Ground	Mulched Ground	5-year Reclamation	Bare Ground	Mulched Ground	5-year Reclamation	Bare Ground	Mulched Ground	5-year Reclamation
Proposed Action	29,230	4,134	1,235	11,692	1,653	494	484	68	20	194	27	8
Alternative A	36,441	5,153	1,540	14,576	2,061	616	637	90	27	255	36	11
Alternative B-1	22,346	3,160	944	8,939	1,264	378	417	59	18	167	24	7
Alternative B-2	29,084	4,113	1,229	11,634	1,645	492	573	81	24	229	32	10
Alternative C-1	26,956	3,812	1,139	10,782	1,525	456	473	67	20	189	27	8
Alternative C-2	33,759	4,774	1,426	13,504	1,910	571	624	88	26	250	35	11
No Action	14,361	2,031	607	5,744	812	243	267	38	11	107	15	5

APPENDIX 4B
METHODOLOGY FOR CALCULATING INDIRECT IMPACTS TO BIG GAME

APPENDIX 4B
METHODOLOGY FOR CALCULATING INDIRECT IMPACTS TO BIG GAME

The displacement of big game from project facilities is estimated using a two step approach, in order to factor in the mitigative effects of winter road closure for mule deer, elk, and moose. Only the first step is used for black bear and pronghorn antelopes because the winter closures would have no effect on them, due to season of activity (bear) and type and location of habitat (antelope).

First, a buffer zone is placed around all roads and facilities within the Project Area. The displacement distance used to determine the buffer zone varies by species and is based on literature accounts, distances used in previous EISs within the Price River Resource Area and comments from the UDWR (Moretti 1995). The area within this displacement zone represents the total acreage subject to some degree of wildlife displacement.

Second, a rating of magnitude of impact, based on expected levels of human activity, is applied to each buffer zone. Levels of human activity are estimated based on (1) the potential for closure of roads in the winter to reduce traffic during the critical winter period, and (2) the size of the road. For areas included within the proposed BLM gate closure system, habitat effectiveness within the buffer zone is assumed to be reduced by 25 percent for resource roads, and by 50 percent for local and collector roads. In areas which will not be closed, habitat effectiveness is assumed to be reduced by 100 percent within the buffer zone. Existing roads which will not be upgraded, such as the Consumers Wash Road, are assumed to represent the baseline condition, however, wells and access roads along them are included in the analysis of indirect impacts.

The results are presented in Section 4.7. Interim work products showing the two step analysis are provided below, for mule deer, elk, and moose.

TABLE 4.B-1
ANALYSIS OF INDIRECT IMPACTS ON DEER BY ALTERNATIVE

		Winter Closure Areas						Areas Not Closed in Winter								Winter Closure and No Winter Closure			
		Acres Affected			Acres of Reduced Habitat Effectiveness			Acres Affected					Acres of Reduced Habitat Effectiveness[1]						
Habitat Types	Total Acres of Habitat Available	Collector & Local Roads	Resource Roads	Total Acres Affected	Collector & Local Roads[2]	Resource Roads[3]	Total Acres Reduced Habitat Effectiveness	C + L winter cl and non-winter cl.	Collector & Local Roads	Resource winter cl. and non-winter cl.	Resource Roads	Total Acres Affected	Collector & Local Roads	Resource Roads	Total Acres Reduced Habitat Effectiveness	Total Acres Affected	Percent of Habitat Available	Total Acres Reduced Habitat Effectiveness	Percent of Habitat Available
Proposed Action																			
Critical Winter	53870	2403	7848	10251	1201	1962	3163	3624.27	1222	13743.16	5895	7116	1222	5895	7116	17367	32.2	10280	19.1
High Value Winter	51809	1985	4935	6920	992	1234	2226	4798.10	2813	11030.55	6095	8908	2813	6095	8908	15829	30.6	11135	21.5
Critical Summer	1285	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0	0.0	0	0.0
Limited value Yearlong	77005	0	1	1	0	0	0	3715.56	3716	17238.71	17237	20953	3716	17237	20953	20954	27.2	20953	27.2
Alternative A																			
Critical Winter	53870	2403	10578	12981	1201	2645	3846	3624.24	1222	18538	7960	9181	1222	7960	9181	22162	41.1	13027	24.2
High Value Winter	51809	1985	5762	7747	992	1440	2433	4798.11	2813	13884	8122	10935	2813	8122	10935	18682	36.1	13368	25.8
Critical Summer	1285	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0	0.0	0	0.0
Limited value Yearlong	77005	0	2	2	0	1	1	3715.59	3716	28002	28000	31715	3716	28000	31715	31718	41.2	31716	41.2
Alternative B1																			
Critical Winter	53870	1057	1835	2892	529	459	987	1859.66	802	4724.87	2890	3692	802	2890	3692	6585	12.2	4680	8.7
High Value Winter	51809	1985	3208	5193	992	802	1794	4798.06	2813	9190.201	5982	8796	2813	5982	8796	13988	27.0	10590	20.4
Critical Summer	1285	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0	0.0	0	0.0
Limited value Yearlong	77005	0	1	1	0	0	0	3715.55	3716	17249.54	17248	20964	3716	17248	20964	20965	27.2	20964	27.2
Alternative B2																			
Critical Winter	53870	1057	3068	4125	529	767	1296	1859.64	802	7173.921	4106	4908	802	4106	4908	9034	16.8	6204	11.5
High Value Winter	51809	1985	3899	5884	992	975	1967	4798.08	2813	11899.08	8000	10813	2813	8000	10813	16697	32.2	12780	24.7
Critical Summer	1285	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0	0.0	0	0.0
Limited value Yearlong	77005	0	1	1	0	0	0	3715.58	3716	27888.49	27887	31603	3716	27887	31603	31604	41.0	31603	41.0
Alternative C1																			
Critical Winter	53870	2321	5638	7959	1161	1409	2570	3542.85	1222	10961.97	5324	6546	1222	5324	6546	14505	26.9	9116	16.9
High Value Winter	51809	1641	3947	5588	820	987	1807	4454.16	2813	9950.692	6004	8817	2813	6004	8817	14405	27.8	10624	20.5
Critical Summer	1285	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0	0.0	0	0.0
Limited value Yearlong	77005	0	1	1	0	0	0	3715.57	3716	17238.71	17237	20953	3716	17237	20953	20954	27.2	20953	27.2
Alternative C2																			
Critical Winter	53870	2321	7494	9815	1161	1874	3034	3542.83	1222	14675	7181	8402	1222	7181	8402	18218	33.8	11437	21.2
High Value Winter	51809	1641	4670	6311	820	1168	1988	4454.17	2813	12749	8079	10892	2813	8079	10892	17203	33.2	12880	24.9
Critical Summer	1285	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0	0.0	0	0.0
Limited value Yearlong	77005	0	2	2	0	1	1	3715.61	3716	28002	28000	31715	3716	28000	31715	31718	41.2	31716	41.2
No Action																			
Critical Winter	53870	1025	1908	2933	512	477	989	1729.55	705	4543.185	2635	3340	705	2635	3340	6273	11.6	4329	8.0
High Value Winter	51809	1985	2959	4944	992	740	1732	2555.23	570	5074.478	2115	2686	570	2115	2686	7630	14.7	4418	8.5
Critical Summer	1285	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0	0.0	0	0.0
Limited value Yearlong	77005	0	1	1	0	0	0	2014.79	2015	9071.941	9070	11085	2015	9070	11085	11087	14.4	11086	14.4

[1]Habitat Reduction Factor = 0%
[2]Habitat Reduction Factor = 50%
[3]Habitat Reduction Factor = 25%

TABLE 4.B-2
ANALYSIS OF INDIRECT IMPACTS ON ELK BY ALTERNATIVE

		Winter Closure Areas						Areas Not Closed in Winter						Winter Closure and No Winter Closure			
		Acres Affected			Acres of Reduced Habitat Effectiveness			Acres Affected			Acres of Reduced Habitat Effectiveness[1]						
Habitat Types	Total Acres of Habitat Available	Collector & Local Roads	Resource Roads	Total Acres Affected	Collector & Local Roads[2]	Resource Roads[3]	Total Acres Reduced Habitat Effectiveness	Collector & Local Roads	Resource Roads	Total Acres Affected	Collector & Local Roads	Resource Roads	Total Acres Reduced Habitat Effectiveness	Total Acres Affected	Percent of Habitat Available	Total Acres Reduced Habitat Effectiveness	Percent of Habitat Available
Proposed Action																	
Critical Yearlong	276	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0.0
Critical Winter	30422	5454	17118	22572	2727	4279	7006	2549	1259	3808	2549	1259	3808	26380	86.7	10815	35.5
High Value Winter	67760	11633	12372	24005	5817	3093	8909	10243	18740	28983	10243	18740	28983	52988	78.2	37892	55.9
Substantial Value Winter	33804	0	404	404	0	101	101	7675	12328	20003	7675	12328	20003	20407	60.4	20104	59.5
Limited Value Winter	13781	0	0	0	0	0	0	67	2663	2730	67	2663	2730	2730	19.8	2730	19.8
Critical Summer	146	0	0	0	0	0	0	0	88	88	0	88	88	88	60.1	88	60.1
Alternative A																	
Critical Yearlong	276	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0.0
Critical Winter	30422	5454	17160	22614	2727	4290	7017	2549	1262	3811	2549	1262	3811	26425	86.9	10828	35.6
High Value Winter	67760	11634	13378	25011	5817	3344	9161	10242	19099	29341	10242	19099	29341	54352	80.2	38502	56.8
Substantial Value Winter	33804	0	510	510	0	128	128	7675	19236	26911	7675	19236	26911	27422	81.1	27039	80.0
Limited Value Winter	13781	0	0	0	0	0	0	67	3822	3889	67	3822	3889	3889	28.2	3889	28.2
Critical Summer	146	0	0	0	0	0	0	0	88	88	0	88	88	88	60.3	88	60.3
Alternative B1																	
Critical Yearlong	276	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0.0
Critical Winter	30422	5454	10215	15669	2727	2554	5281	2549	1832	4382	2549	1832	4382	20050	65.9	9662	31.8
High Value Winter	67760	7289	3902	11191	3644	976	4620	8686	15982	24668	8686	15982	24668	35859	52.9	29288	43.2
Substantial Value Winter	33804	0	98	98	0	25	25	7675	12290	19965	7675	12290	19965	20063	59.4	19990	59.1
Limited Value Winter	13781	0	0	0	0	0	0	67	2671	2738	67	2671	2738	2738	19.9	2738	19.9
Critical Summer	146	0	0	0	0	0	0	0	88	88	0	88	88	88	60.1	88	60.1
Alternative B2																	
Critical Yearlong	276	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0.0
Critical Winter	30422	5454	10952	16406	2727	2738	5465	2549	2073	4622	2549	2073	4622	21028	69.1	10087	33.2
High Value Winter	67760	7289	6185	13474	3644	1546	5191	8686	17493	26179	8686	17493	26179	39653	58.5	31370	46.3
Substantial Value Winter	33804	0	99	99	0	25	25	7675	19489	27164	7675	19489	27164	27263	80.7	27189	80.4
Limited Value Winter	13781	0	0	0	0	0	0	67	3787	3854	67	3787	3854	3854	28.0	3854	28.0
Critical Summer	146	0	0	0	0	0	0	0	88	88	0	88	88	88	60.1	88	60.1
Alternative C1																	
Critical Yearlong	276	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0.0
Critical Winter	30422	4300	12450	16750	2150	3112	5262	2549	1557	4106	2549	1557	4106	20856	68.6	9369	30.8
High Value Winter	67760	11591	9583	21174	5796	2396	8191	10242	19862	30104	10242	19862	30104	51278	75.7	38295	56.5
Substantial Value Winter	33804	0	174	174	0	43	43	7675	12338	20013	7675	12338	20013	20187	59.7	20057	59.3
Limited Value Winter	13781	0	0	0	0	0	0	67	2663	2730	67	2663	2730	2730	19.8	2730	19.8
Critical Summer	146	0	0	0	0	0	0	0	88	88	0	88	88	88	60.1	88	60.1

TABLE 4.B-2
ANALYSIS OF INDIRECT IMPACTS ON ELK BY ALTERNATIVE

		Winter Closure Areas						Areas Not Closed in Winter						Winter Closure and No Winter Closure			
		Acres Affected			Acres of Reduced Habitat Effectiveness			Acres Affected			Acres of Reduced Habitat Effectiveness[1]						
Habitat Types	Total Acres of Habitat Available	Collector & Local Roads	Resource Roads	Total Acres Affected	Collector & Local Roads[2]	Resource Roads[3]	Total Acres Reduced Habitat Effectiveness	Collector & Local Roads	Resource Roads	Total Acres Affected	Collector & Local Roads	Resource Roads	Total Acres Reduced Habitat Effectiveness	Total Acres Affected	Percent of Habitat Available	Total Acres Reduced Habitat Effectiveness	Percent of Habitat Available
Alternative C2																	
Critical Yearlong	276	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0.0
Critical Winter	30422	4300	12656	16956	2150	3164	5314	2549	1727	4276	2549	1727	4276	21232	69.8	9590	31.5
High Value Winter	67760	11591	10618	22209	5796	2655	8450	10242	20859	31100	10242	20859	31100	53310	78.7	39550	58.4
Substantial Value Winter	33804	0	329	329	0	82	82	7675	19417	27093	7675	19417	27093	27422	81.1	27175	80.4
Limited Value Winter	13781	0	0	0	0	0	0	67	3822	3889	67	3822	3889	3889	28.2	3889	28.2
Critical Summer	146	0	0	0	0	0	0	0	88	88	0	88	88	88	60.1	88	60.1
No Action																	
Critical Yearlong	276	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0.0
Critical Winter	30422	5454	10182	15636	2727	2546	5272	48	1172	1220	48	1172	1220	16856	55.4	6492	21.3
High Value Winter	67760	7165	3820	10985	3582	955	4537	4417	12391	16808	4417	12391	16808	27793	41.0	21346	31.5
Substantial Value Winter	33804	0	98	98	0	25	25	4897	7788	12685	4897	7788	12685	12783	37.8	12709	37.6
Limited Value Winter	13781	0	0	0	0	0	0	0	2432	2432	0	2432	2432	2432	17.6	2432	17.6
Critical Summer	146	0	0	0	0	0	0	0	88	88	0	88	88	88	60.1	88	60.1

[1]Habitat Reduction Factor = 0%
[2]Habitat Reduction Factor = 50%
[3]Habitat Reduction Factor = 25%

TABLE 4.B-3

ANALYSIS OF INDIRECT IMPACTS ON MOOSE BY ALTERNATIVE

		Winter Closure Areas							Areas Not Closed in Winter							Closure and No Winter Closure			
		Acres Affected			Acres of Reduced Habitat Effectiveness				Acres Affected			Acres of Reduced Habitat Effectiveness[1]							
Habitat Types	Total Acres of Habitat Available	Collector & Local Roads	Resource Roads	Total Acres Affected	Collector & Local Roads[2]	Resource Roads[3]	Percent of Habitat Available	Total Acres Reduced Habitat Effectiveness	Collector & Local Roads	Resource Roads	Total Acres Affected	Collector & Local Roads	Resource Roads	Total	Total Acres Reduced Habitat Effectiveness	Total Acres Affected	Percent of habitat Affected	Total Acres of Reduced Habitat Effectivenes	Percent of Habitat Available
Proposed Action																			
Low Value Winter	20198	7224	7085	14309	3612	1771	8.8	5383	79	1363	1442	79	1363	1442	6825	15751	78.0	12209	60.4
Alternative A																			
Low Value Winter	20198	7224	7144	14368	3612	1786	8.8	5398	79	1324	1403	79	1324	1403	6801	15771	78.1	12199	60.4
Alternative B1																			
Low Value Winter	20198	7224	4953	12177	3612	1238	6.1	4850	79	1363	1442	79	1363	1442	6292	13619	67.4	11143	55.2
Alternative B2																			
Low Value Winter	20198	7224	5445	12669	3612	1361	6.7	4973	79	1325	1404	79	1325	1404	6377	14073	69.7	11351	56.2
Alternative C1																			
Low Value Winter	20198	6030	4549	10579	3015	1137	5.6	4152	79	1410	1489	79	1410	1489	5641	12068	59.7	9794	48.5
Alternative C2																			
Low Value Winter	20198	6030	4741	10771	3015	1185	5.9	4200	79	1400	1479	79	1400	1479	5679	12250	60.6	9880	48.9
No Action																			
Low Value Winter	20198	7224	4586	11810	3612	1147	5.7	4759	79	1248	1327	79	1248	1327	6086	13137	65.0	10844	53.7

[1]Habitat Reduction Factor = 0%
[2]Habitat Reduction Factor = 50%
[3]Habitat Reduction Factor = 25%

APPENDIX 4C
WILDLIFE MITIGATION PLAN

Moab District
Price River/San Rafael Resource Area
125 South 600 West
P.O. Box 7004
Price, Utah 84501

(UT-066)

STAFF REPORT

Title: River Gas EIS Wildlife Mitigation Plan

Date: September 9, 1996

Wildlife Mitigation / River Gas EIS

This mitigation plan:

-defines mitigation and identifies the basis for developing and implementing mitigation,
-brief description of the basic types of impacts addressed by mitigation in this plan,
-outlines the objectives for mitigation for big game, raptors, and riparian habitat, and summarizes all mitigation measures identified in the EIS to achieve the objectives and describes specific mitigation methodologies (including costs) and how they apply to River Gas's Proposed Action

The mitigation presented in this plan is applicable to all Federal surface and Federal mineral estate lands in the project area. This mitigation is also applicable to non-federal subsurface lands and is presented as a recommendation to mitigate impacts to wildlife on these lands. It should be pointed out that while mitigation identified in this plan is directed towards minimizing impacts to wildlife, this mitigation may also benefit other resources impacted by gas field development.

All of the mitigation presented in this plan meets one of the following criteria:

-represents legal mandate
-has been committed to by River Gas (RGC environmental protection measures or lease stipulations),
-represents a BLM Land Use Plan decision which would be imposed as a requirement to assure development complies with the Land Use Plan
-was developed in Chapter 4 of the EIS, with supporting rationale, to mitigate significant impacts and avoid unnecessary and undue degradation of the public lands as mandated in the Federal Land Policy and Management Act of 1976. (Since Developed Mitigation Measures were included to address specific significant impacts not covered by committed mitigation or required protection measures, supporting rationale from Chapter 4 has been included in this plan to clarify the need for this mitigation.)

MITIGATION DEFINED, AND BASIS FOR DEVELOPING AND IMPLEMENTING MITIGATION

The National Environmental Policy Act of 1969 (42 U.S.C. 4321-4347) and its implementing regulations (40 CFR Part 1500-1508) formally introduce the concept of mitigation into the Bureau's Environmental Analysis Process. Part 1508.20 of the NEPA regulations define

mitigation as:

Avoiding the impact altogether by not taking a certain action or parts of an action:

Minimizing the impact by limiting the degree or magnitude of the action and its implementation;

Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;

Reducing or eliminating the impact over time by preservation and maintenance operation during the life of the action;

Compensating for the impact by replacing or providing substitute resources or environments.

Bald Eagle Protection Act:

The Bald Eagle Protection Act, Pub.L. 87-884, prohibits the taking of any Bald or golden eagle, alive or dead, or any part, nest, or egg thereof. Taking is defined in the Act as: ...pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb...

Migratory Bird Treaty Act:

Migratory Bird Treaty Act protects all raptor nests from physical destruction

National Environmental Policy Act (NEPA):

The National Environmental Policy Act of 1969, establishing the environmental assessment process, states... "the Congress authorizes and directs that, to the fullest extent possible... all agencies of the Federal Government shall identify and develop methods and procedures... which will ensure that presently unquantified environmental amenities and values be given appropriate consideration in decision making... (emphasis added).

Federal Land Policy and Management Act (FLPMA):

The Federal Land Policy and Management Act of 1976 directs the Secretary that ...in managing the public lands, the Secretary shall, subject to this Act and other applicable laws and under such terms and conditions as are consistent with such law, regulate, through easements, permits, leases, licenses, published rules, or other instruments as the Secretary deems appropriate, the use, occupancy, and development of the public lands...

Title III Section 302 states... In managing the public lands the Secretary shall, by regulation or otherwise, take any action necessary to prevent unnecessary or undue degradation of the lands.

43 CFR 1610.5-3 Conformity and Implementation:

(a) All future resource management authorizations and actions...shall conform to the approved (Land Use) plan.

43 CFR 3101.1-2 Oil and Gas Surface Lease Rights:

A lessee shall have the right to use so much of the leased lands as is necessary to explore for, drill for, mine, extract, remove and disposed of all the leased resource in a leasehold subject to: Stipulations attached to the lease; restrictions deriving from specific, nondiscretionary statutes; and such reasonable measures as required by the authorized officer to minimize adverse impact to other resource values, land uses or users not addressed in the lease stipulations at the time operations are proposed. To the extent consistent with lease rights granted, such reasonable measure may include, but are not limited to, modification to siting or design of facilities, timing of operations and specification of interim and final reclamation measures. At a minimum, measures shall be deemed consistent with the lease rights granted provided they do not require relocation of proposed operations by more than 200 meters;...

Oil and Gas Lease Provisions:

Sections 6. Conduct of operations states... Lessee shall conduct operations in a manner that minimizes adverse impacts to the land, air and water, to cultural, biological, visual, and other resources, and to other land uses or users. Lessee shall take reasonable measures deemed necessary by the lessor to accomplish the intent of this section.

BLM Internal Policy:

BLM.ER.0317, a memorandum from the Office of the Solicitor, Washington D.C. dealing with mitigation on split estate lands states... Mitigation measures for impacts which are identified during your NEPA analysis may be imposed under the general authority set out in sections 30 and 37 of the Mineral Leasing Act of 1920, 30 U.S.C. 187 and 193, the policies of FLPMA, 43 U.S.C. 1701, or under a statute such as the ESA which specifically authorizes or prescribes mitigation.

Washington Office Instruction Memorandum WO 92-67 Application of New Mitigation Measures to Existing Oil and Gas Leases.

Policy: BLM policy will be as follows:

Item 2. ...mitigation would be considered inconsistent with lease rights if it renders the operation uneconomical or technically unfeasible; ...mitigation may be appropriate if it is required to prevent unnecessary and undue degradation of public lands or resources.

BRIEF DESCRIPTION OF TYPES OF IMPACTS ADDRESSED BY MITIGATION IN THIS PLAN

The EIS described two basic types of impacts associated with gas field development and operation that would affect wildlife resources. These are **Direct Impacts** or surface disturbance impacts and **Indirect Impacts** or impacts of wildlife displacement and indirect mortality. Surface disturbance impacts include physical surface disturbance associated with construction activity. These impacts occur primarily during the construction/drilling phase when roads are being built, wells are being drilled, and necessary facilities are being constructed. Displacement impacts are associated with increased human activity in the gas field, both during construction/drilling and during maintenance and operation of the field and occur for the life of the project. Many species of wildlife avoid these areas of human activity or are displaced from habitat adjacent to these

activity centers. This type of impact is generally only significant when it occurs during a critical time period for wildlife, such as when big game are present on their winter range. The other indirect impact is increased mortality from vehicle collisions, increased legal and illegal harvest. All of the impacts mentioned above are described in depth in Chapter 4. These impacts are common to all alternatives and vary only in degree or magnitude, depending on the alternative.

An important variable that changes significantly by alternative is the opportunity to complete described mitigation within the project area. This is dependant on the density of development and whether sufficiently sized parcels of habitat are not developed. Only the Critical Habitat Protection Alternative, the Security Areas Protection Alternative and the No Action Alternative provide specific areas to be managed as wildlife habitat free of development. These alternatives provide opportunities for mitigation work to be completed within the project area.

Wildlife species identified as being significantly impacted include the mule deer, elk, mountain lion, golden eagle and other raptors. These species are specifically addressed in this plan with the exception of the mountain lion. However, since the mountain lion is closely associated with big game populations, mitigation identified for big game will also benefit the mountain lion.

BIG GAME MITIGATION OBJECTIVES AND APPLICABLE MITIGATION MEASURES

DIRECT IMPACT MITIGATION (SURFACE DISTURBANCE IMPACTS)

Big Game Mitigation Objective #1: Design development in such a way to be most compatible and least conflicting with big game winter range values.

> BLM Requirement #1, excerpt: Final well locations and transportation corridor alignments would be selected and designed to avoid or minimize disturbances to sensitive areas, including areas of high value wildlife habitat...
>
> BLM Requirement # 22, excerpt: Revegetation on big game critical winter range will include hand planting of seedling browse plants and use of seedling protectors.

Big Game Mitigation Objective #2: Replace physical loss of forage production on big game winter range resulting from all surface disturbance by completing vegetative treatment projects designed to increase forage production and support increased numbers of wintering big game.

> BLM Requirement # 38, excerpt: Where disturbance exceeds 10 acres in elk, mule deer, or moose critical winter range, an equivalent acreage of adjacent habitat will be upgraded to accommodate increased use and is to be completed commensurate with surface disturbing activity.
>
> BLM Developed Mitigation # 1,: Where disturbance exceeds 10 acres in elk or mule deer high value winter range, an equivalent acreage of adjacent habitat will be upgraded to accommodate increased use, and is to be completed commensurate with surface disturbing activity.

Supporting Rationale for BLM Developed Mitigation #1:

Impacts of surface disturbance on Federal lands classified as high value big game winter range were identified in the EIS and are excerpted below. These impacts were not addressed by required mitigation measures but were deemed significant in Chapter 4 of the EIS. BLM Developed Mitigation #1 provides mitigation for these impacts.

It should also be noted that in addition to the impacts described below on Federal lands, no mitigation has been committed to, to address surface disturbance impacts which will occur on private and state trust lands classified as critical and high value winter range in the project area.

Alternatives	Acres of Surface Disturbance on Big Game High Value Winter Range (Federal Lands)	
	Mule Deer	Elk
Proposed Action-160 Acre Spacing	690	1,140
Alternative A-80 Acre Spacing	904	1,527
Alternative B1-160 Acre Spacing	581	496
Alternative B2-80 Acre Spacing	768	641
Alternative C1-160 Acre Spacing	630	1,037
Alternative C2-80 Acre Spacing	845	1,374
No Action	121	149

DESCRIPTION OF ACRE FOR ACRE SURFACE DISTURBANCE MITIGATION REQUIREMENT

This mitigation measure specifies that the proponent complete an offsite habitat enhancement project to increase forage production on big game winter range. The enhancement work would be done at a rate of one acre of habitat enhancement for each acre of disturbance. All aspects of project work are the responsibility of the lessee/operator.

This offsite enhancement work would be done as close as possible to the impacted area, to benefit the impacted population. However, to assure maximum benefit to wildlife, the work would not be located closer than .5 miles from existing or proposed development. If proposed development is at a density which would preclude the opportunity for enhancement work to be completed within the same herd unit, the work would be done, nearby in an adjacent herd unit to benefit the same species of wildlife.

As mentioned earlier, not all alternatives provide the opportunity to complete mitigation work in the same herd unit impacted by development. Neither the Proposed Action or Alternative A provides for sizeable areas of wildlife habitat to remain free of development. Much of the mitigation work under these alternatives would require completing mitigation projects in adjacent herd units. The Critical Habitat Protection Alternative, the Security Areas Protection Alternative

and the No Action Alternative provide for areas of critical habitat to be managed for wildlife and free of development.

While the mitigation requirement specifies that the lessee/operator complete all aspects of the offsite enhancement work, BLM has been approached with the option of the lessee/operator providing a monetary contribution sufficient to cover the costs of mitigation work. This would relieve the lessee/operator for any further responsibility of completing the enhancement projects. Under this option the BLM would utilize the funds accumulated to complete all aspects of the enhancement work. It should be pointed out that the final arrangement between BLM and River Gas for addressing this mitigation has not been formalized. BLM will continue to work with River Gas to determine an approach that will both, meet the mitigation requirement and be most cost effective to River Gas.

The mitigation presented below deals primarily with River Gas making a monetary payment to cover the costs of mitigation work rather than River Gas administering and completing all aspects of mitigation project work (planning, survey and design, contract administration, etc).. This is based on River Gas's preference to do so as demonstrated in previous mitigation discussions. With this in mind it is important to understand that the monetary payment identified for mitigation relieves River Gas from expending any other resources or personnel time for the completion of mitigation work.

<u>Description of Habitat Enhancement Projects Designed to Mitigate Surface Disturbance Impacts</u>

Five typical enhancement projects that have been used as offsite mitigation for acre for acre enhancement in the Price River Resource Area are listed below. Attachment 1 describes these projects and the costs for implementation in detail.

Habitat Enhancement Project		Project Cost per Acre*
<u>Prescribed Burn and Seed</u>		244.00
<u>Browse Transplanting</u>	Bare Rootstock Browse Plants	237.50
	Tubling Browse Plants	327.50
<u>PJ Mechanical Treatment (2 way)</u>		266.13
<u>Selective PJ Mechanical Treatment</u>		349.40
<u>PJ Treatment Maintenance</u>		210.90
AVERAGE PROJECT COST PER ACRE		**272.57**

* Costs are based on 1996 prices for materials and services, assuming a 100 acre project size and includes costs of actual enhancement work and costs associated with project administration.

Costs to complete these projects are listed for each methodology. These costs were averaged to provide an average cost estimate for acre for acre enhancement. This cost for completing habitat enhancement projects is <u>$272.57</u> per acre.

Application of Surface Disturbance Mitigation to River Gas Project, Proposed Action*

Acres of Total Surface Disturbance Requiring Acre for Acre Mitigation (Proposed Action)

	Federal Acres	Total Acres (All Lands)
Critical Winter Range	1,122	1,899
High Value Winter Range	476	656
Total	1,598	2,555

Project Area Wide Mitigation Costs (surface Disturbance Mitigation)
2,555 (acres) X 272.57 (average total cost per acre) =................696,416.35

Federal Surface/Subsurface Mitigation Costs (Surface Disturbance)
1,598 (acres) X 272.57 (average total project costs per acre)......435,566.86

*Note, this applies to the proposed action. The same formula would be applied to other alternatives bases on surface disturbance associated with each.

INDIRECT IMPACT MITIGATION (DISPLACEMENT IMPACTS AND MORTALITY IMPACTS)

Big Game Mitigation Objective #3: Avoid displacement impacts of construction/drilling by timing restrictions to prevent this activity from occurring on winter range during the winter period when big game are present on their winter range (November 1 to May 15).

> BLM Requirement #37, excerpt: Exploration, drilling and other development will be allowed only during the period May 16 through October 31 in elk, mule deer, or moose winter range...
>
> RGC # 15 On private and state land RGC will make every effort to complete drilling before the beginning of November on big game critical winter range, to reduce the potential for disturbance to wintering big game... but... drilling lease schedules may necessitate the continuance of drilling into November or December.

Big Game Mitigation Objective #4: Compensate for unavoidable impacts of reduced habitat suitability and wildlife displacement associated with field maintenance and operation for the life of the field.

> BLM Developed Mitigation # 2: Proponent shall participate in a Wildlife Habitat Impact Mitigation Program similar to that developed for the Castlegate Coalbed Methane EIS and for the Helper Coalbed Methane Field. Participation in this program would involve entering into a Cooperative Agreement and providing a monetary contribution on a per well basis into a dedicated account managed by BLM and the Utah Division of Wildlife Resources. This fund has been established as a mitigation fund dedicated to the purposes of funding local wildlife habitat enhancement/acquisition projects for the mitigation of impacts to wildlife habitat.

Supporting Rationale for BLM Developed Mitigation # 2

Impacts of wildlife displacement were identified in the EIS and are excerpted below. These impacts were not addressed by required mitigation measures but were deemed significant in Chapter 4 of the EIS. BLM Developed Mitigation #2 provides mitigation for these impacts. Similar impacts of CBM field maintenance and operation were identified for the Castlegate EIS and Helper CBM field. BLM Developed Mitigation #2 was deemed reasonable and appropriate and was applied and remains in effect on these previous projects.

Alternatives	Acres of Displacement Impacts on Big Game Winter Range (Federal Lands)			
	Mule Deer		Elk	
	Critical Winter	High Value Winter	Critical Winter	High Value Winter
Proposed Action-160 Acre Spacing	6,376	7,692	6,338	26,259
Alternative A-80 Acre Spacing	7,944	9,458	6,368	26,383
Alternative B1-160 Acre Spacing	1,109	7,290	5,085	18,067
Alternative B2-80 Acre Spacing	1,438	8,985	5,506	19,148
Alternative C1-160 Acre Spacing	5,397	7,438	5,293	26,579
Alternative C2-80 Acre Spacing	6,783	9,203	65,511	27,224
No Action	934	1,476	2,386	10,645

Project Area Population Affects from Displacement Impacts

Alternatives	Projected Percent Reduction in Winter Range Carrying Capacity	
	Mule Deer	Elk
Proposed Action-160 Acre Spacing	19%	36%
Alternative A-80 Acre Spacing	24%	36%
Alternative B1-160 Acre Spacing	9%	32%
Alternative B2-80 Acre Spacing	12%	33%
Alternative C1-160 Acre Spacing	17%	31%
Alternative C2-80 Acre Spacing	21%	32%
No Action	8%	21%

RGC 13 RGC will use a remote monitoring system that will limit the number of routine visits to wells.

Proposed Action: RGC will participate in the winter seasonal closure of selected roads in critical winter range to reduce disturbance to big game. The closure will limit vehicular access on these roads (normally closed during the winter by snow conditions) to normal maintenance and operation of gas wells and facilities and other authorized uses.

See Big Game Mitigation Objective #1, applicable to Mortality Impact Mitigation Measures below:

RGC # 10 RGC will not allow firearms or pets to be brought into the project area by employees or contractors during project work.

RGC # 11 RGC will not allow harassment of wildlife by employees or contractors and will arrange for training of its employees and contractors on this issue.

RGC # 12 RGC will enforce adherence to speed limits by its employees and contractors while working on the project

DESCRIPTION OF DISTURBANCE-DISPLACEMENT IMPACT MITIGATION

Description of Habitat Enhancement Projects Designed to Mitigate Disturbance-Displacement Impacts:

Based on analysis in Chapter 4 of the EIS, an average of 58 acres of displacement impacts for mule deer and 133 acres of displacement impacts for elk are associated with each well. Applying habitat enhancement methodologies described for surface disturbance impacts would represent an unreasonable mitigation obligation.

For this reason, a different approach to mitigation of displacement impacts has been developed. Rather than acre for acre enhancement involving vegetative treatment, the mitigation strategy for displacement impacts is acre for acre enhancement directed towards effecting a change in surface management of a suitable habitat area that will directly benefit wildlife. The change in surface management would eliminate or minimize an existing conflict with wildlife.

The mitigation standard developed to mitigate disturbance-displacement impacts was first utilized for the Castlegate CBM EIS. The mitigation standard consists of the lessee/operator making a one time monetary contribution of 750.00 per well for all wells covered by the EIS. The funds accumulated by this mitigation would be used to implement specific changes in management that would directly benefit wildlife populations.

Examples of changes in surface management, suitable as displacement mitigation, are listed below.

-Purchase of grazing AUMs (on a willing seller basis) to be relinquished back to BLM for the life of the project.

-Purchase of small private land tracts intermingled in large public land tracts (on a willing seller basis), where the purchase can effect a change in management beneficial to wildlife on the entire land tract.

(As mentioned in the introduction of this appendix, some mitigation proposed for wildlife may serve as effective mitigation for other impacted resource values. As an example, the type of purchase indicated above, could also serve to replace some of the recreational values lost in the project area.)

-Apply a combination of habitat improvement practices on a prescription basis, as described below, where only a small percentage of habitat is manipulated.

-Implement habitat enhancement on a small percentage of the project area.
-Construct water development on project area.
-Construct fencing to provide better control and distribution of livestock grazing to achieve wildlife objectives.

Internal analysis of costs to implement these prescriptions, based on estimated current market values, show the 750.00 per well represents only 20 to 80 percent of the cost to implement this mitigation. This would require BLM to seek cooperation with outside interested entities to fully implement this mitigation.

Application of Existing Displacement Mitigation Standard to River Gas Project Area, Proposed Action:

Applied to River Gas Proposed Action:	750.00 X 601(wells)=	450,750.00
Applied to only federal wells: (proposed action)	**750.00 X 381(wells)=**	**285,750.00**

Summary of Surface Disturbance and Displacement Mitigation for River Gas Proposed Action:

Mitigation for Impacts on Federal surface and Federal Subsurface

Surface Disturbance Impact Mitigation....................................435,566.86
Displacement Impact Mitigation..285,750.00

Total Mitigation Obligation for Federal Lands...........................721,316.86

Recommended Mitigation for Impacts on River Gas Project Area Wide, All Lands

Surface Disturbance Impact Mitigation....................................696,416.35
Displacement Impact Mitigation..450,750.00

Total Mitigation Obligation for All Lands................................1,147,166.35

Test of Reasonableness of Identified Mitigation

All mitigation identified to address impacts of proposed Federal Actions is intended to accommodate multiple use and maintain the health of the public lands. Even so, mitigation should be prudent and reasonable. The following discussion of reasonableness has been included to put costs of identified mitigation in perspective with costs of project development to help understand this issue. In addition, several tests can be employed to determine whether mitigation is reasonable compared with local industry standards and practices. These are also provided in the following discussion.

Mitigation Costs Compared to Costs of Drilling and Equipping Well:

The monetary costs, on a per well basis, of the mitigation proposed for big game for both surface disturbance and displacement impacts is **$1,893.22** for Federal wells.

According to the August 5, 1996, Oil and Gas Journal, the average cost for drilling and completing a coalbed methane well in the Price Area is **$246,408.96**. This cost does not include costs associated with injection wells, road construction, pipelines and support facilities needed to produce gas which would increase the costs per well substantially. However, based strictly on costs to drill and complete a well, the mitigation costs represents approximately seven tenths of one percent of the cost associated with drilling and completing a well.

Has the mitigation requirement been successfully implemented in the past?

The acre for acre enhancement requirement for surface disturbance has been an industry standard in the Price area since 1983. This Land Use Plan decision has been successfully implemented for surface disturbance associated with coal mine development, oil and gas operations, power transmission projects, sand and gravel operations, road construction projects, airport expansion etc. The decision has been implemented primarily with private industry, but has also been incorporated into county government projects.

The acre for acre enhancement for displacement impacts has been applied to projects associated with the coal mine industry, county road projects and previous CBM development projects.

Has the requirement caused any proposed projects to be dismissed or abandoned because the requirement is too severe or made the project uneconomical?

The acre for acre mitigation requirements for surface disturbance and displacement impacts have not resulted in any project being dropped due to economics. In fact, in many cases, companies have voluntarily participated in projects to enhance a larger acreage than required by the mitigation.

How does the requirement compare to other agency requirements for mitigation?

The Utah Division of Wildlife Resources has a formal mitigation policy in place that requires three acres of enhancement for one acre of disturbance on critical wildlife habitat. This requirement applies to Division owned lands and is submitted as recommended mitigation for all Federal actions with surface disturbance impacts on critical winter range. BLM's required mitigation

represents 1/3 of that considered appropriate by the State Wildlife Management Agency.

Based on the above discussion, mitigation addressing impacts to big game habitat and populations is believed to be reasonable and will serve the public interest in accommodating multiple use and maintaining the health of the land.

Cooperative Agreement to Address Mitigation Obligation

The mitigation obligation identified for Federal lands would be formalized in a cooperative agreement which identifies costs and schedule for payment. This agreement can be structured to accommodate a one-time payment upfront based on 1996 dollars or implemented concurrent with development. If payment is received as development occurs, costs of mitigation will be adjusted according to inflation to assure that the same amount of project work can be done in subsequent years that is proposed with 1996 dollars.

RAPTOR MITIGATION OBJECTIVES AND APPLICABLE MITIGATION MEASURES

DIRECT IMPACT MITIGATION (SURFACE DISTURBANCE IMPACTS)

Direct impacts to raptors would include; physical loss of habitat and the prey base population (small mammal) this habitat supports, and the physical destruction of nests sites due to construction activity.

Raptor Mitigation Objective #1: Avoid destruction of raptor nest sites in raptor nesting areas.

> BLM Requirement #1, excerpt: Final well locations and transportation corridor alignments would be selected and designed to avoid or minimize disturbances to sensitive areas, including areas of high value wildlife habitat...

> BLM Developed Mitigation # 3: Raptor surveys will be required whenever surface disturbance and or occupancy is proposed in association with oil gas exploration/development within a known nesting area for raptors. Field surveys will be conducted by the lessee/operator as determined by the Authorized officer of the BLM. When surveys are required of the lessee/operator, the consultant hired must be found acceptable to the Authorized Officer prior to the field survey being conducted. Based on the results of the field survey, the Authorized Officer will determine appropriate buffer zones.

Raptor Mitigation Objective #2: Minimize the impacts of surface disturbance to raptor foraging habitat by designing vegetative treatment projects proposed as big game mitigation to also support increased populations of small mammals and maintain diversity of nongame birds.

> See Surface Disturbance Impact Mitigation Measures Under Big Game

INDIRECT IMPACT MITIGATION (DISPLACEMENT IMPACTS AND MORTALITY IMPACTS)

Indirect impacts to raptors would include disturbance and human activity located within .5 miles of raptor nesting sites. This type of disturbance can result in adults leaving the nest site and

cause mortality of the young. Repeated disturbance can lead to abandonment of the nest site and loss of production of that nesting territory.

Raptor Mitigation Objective #3: Avoid any activity around raptor nest sites that would affect continued use or otherwise affect production at the nest site.

Proposed Action: ...restriction on well drilling and operations and transportation corridor systems construction on BLM lands (surface and subsurface) within .5 miles of raptors nests documented as occupied within 3 years of proposed activity...

RGC #14: (Private and State Lands) RGC will maintain a seasonal restriction on construction within .5 miles of active raptor nests during the active nesting period, unless circumstances indicate that such a limitation would not be necessary or if such limitation would not be applicable under existing laws or regulations.

BLM Requirement #40; Part 1: Permanent surface disturbance and occupancy (such as oil and gas production wells and facilities) is prohibited within 0.5 miles of raptors nests which have been documented as occupied within a 3 year period.

Site specific evaluations in coordination with the U.S. Fish and Wildlife Service may allow for modifications of this requirement.

Part 2: Temporary surface disturbance and occupancy (i.e. seismic lines, oil and gas exploration, road construction is prohibited within .5 miles radius buffer zones around occupied raptor nests during the nesting season. This requirement does not apply to maintenance and operation of producing wells and access roads.

ATTACHMENT 1

DESCRIPTION AND ESTIMATED COSTS FOR BIG GAME HABITAT ENHANCEMENT PROJECTS

The habitat enhancement projects described below have been applied as big game winter range mitigation projects for surface disturbance impacts in the Price Area.

Prescribed Burn and Seed

Project Description: Complete a prescribed burn and seed operation in big game winter range to improve the diversity and production of high value browse and forb species important for winter and spring forage.

Material: Seed @ 147.00 per acre

Cost of burn operation 15.00 per acre

Cost of equipment for seed application: app. 32.00 per acre for 100 acre project
D-6 Crawler tractor to pull seed drill @ 70.00 hr (8 hrs per 20 acres) =560.00
Estimated Mobilization Cost: 400.00

Administration Cost 50.00 per acre

Total Project Cost per Acre (Based on 100 acre project)...244.00

Typical Seed Mix (used to calculate seed costs)

	Lbs/Acre	Cost/Lb*	Cost/Acre
Western Wheatgrass	1.5	2.60	3.90
Basin Wildrye	1.5	4.80	7.20
Intermediate Wheatgrass	1.5	1.10	1.65
Hard Sheep Fescue	1.5	1.60	2.40
Ladak Alfalfa	2.0	1.45	2.90
Small Burnett	2.0	0.85	1.70
Blue Flax	2.0	6.00	12.00
Wyoming Big Sage	1.0	42.00	42.00
Winter Fat	1.5	22.50	33.75
Forage Kochia	1.5	17.00	25.50
Fourwing Saltbush	2.0	7.00	14.00
Total	18		147.00

* Costs from Granite Seed 7-22-96

Browse Transplanting (Hand Planting with Flamingo Hand Crew)

Project Description: Hand plant and fertilize 200 browse seedling plants per acre into suitable pinyon-juniper/mtn. browse zone to increase the diversity and production of high value browse species important as winter forage.

Materials:	200 browse seedlings per acre	@ .60 each for bare rootstock
		@ 1.05 each for tublings
	200 Fertilizer Tablets per acre	@0.10 ea.

120.00 per acre bare rootstock
210.00 per acre tubling stock

Personnel: 20 person hand crew, 4,750.00 per week

250 plants per person/ day	1.25 acres per person per day
5,000 plants per day (crew)	25 acres per day
20,000 plants per week (crew)	100 acres per week

4,750.00 per 100 acres or 47.50 per acre

Administration Cost 50.00 per acre

Total: Project Cost per Acre: (Based on 100 acre project)

Bare Rootstock Browse Plants..................................237.50 per acre.
Tubling Browse Plants...327.50 per acre

PJ Mechanical Treatment (2 way)

Project Description: Complete a mechanical treatment and reseeding project to remove pinyon-juniper trees in areas where the pinyon-juniper canopy and density has reduced or eliminated production of understory browse, forb and grass species. Reseed high value browse, forb and grass species to assure establishment of desired forage important on winter and spring big game range.

Equipment Operation Costs: 50.00 per acre
2 D-8 crawler tractors @ 105.00 per hour (50 acres per day)
Estimated Mobilization Costs: 800.00
Cost of seed: 161.30 per acre

Cost of aerial Seed Application: 6.00 per acre

Administration Cost 50.00 per acre

Total Project Costs per Acre (Based on 100 acre project)..266.13

Typical Seed Mix

	Lbs/Acre	Cost/Lb*	Cost/Acre
Western Wheatgrass	1.0	2.60	2.60
Thick Spick Wheatgrass	1.0	3.90	3.90
Intermediate Wheatgrass	1.0	1.10	1.10
Hard Sheep Fescue	1.0	1.60	1.60
Ladak Alfalfa	2.0	1.45	2.90
Small Burnett	2.0	0.85	1.70
Blue Flax	2.0	6.00	12.00
Wyoming Big Sage	0.50	42.00	21.00
True Mountain Mahogany	1.5	31.00	46.50
Forage Kochia	1.5	17.00	25.50
Antelope Bitterbrush	1.5	19.00	28.50
Fourwing Saltbush	2.0	7.00	14.00
Total	18		161.30

* Costs from Granite Seed 7-22-96

Selective PJ Mechanical Treatment

Project Description: Complete a mechanical treatment and reseeding project to remove selected areas of pinyon-juniper trees to improve distribution of forage and cover in areas where the pinyon-juniper canopy and density has reduced or eliminated production of understory species. Reseed high value browse, forb and grass species to assure establishment of desired forage important on winter and spring big game range.

Equipment Operation Costs: 25.00 per acre
1 D-8 crawler tractors @ 105.00 per hour (40 acres per day)
Estimated Mobilization Costs: 400.00
Cost of seed: 74.40 per acre

Browse Seedling Plants	100 per acre @ 1.05 ea.	105.00
Fertilizer Tablets	100 per acre @ 0.10 ea.	10.00
Labor Cost to Plant	0.60 ea.	60.00
Seedling Protectors	100 per acre @ 0.25 ea.	25.00
	Subtotal	200.00
Administration Cost		50.00 per acre

Total Project Costs per Acre.(Based on 100 acre project).. 349.40

Typical Seed Mix

	Lbs/Acre	Cost/Lb*	Cost/Acre
Western Wheatgrass	0.5	2.60	1.30
Thick Spick Wheatgrass	0.5	3.90	1.95
Intermediate Wheatgrass	0.5	1.10	0.55
Hard Sheep Fescue	0.5	1.60	0.80
Ladak Alfalfa	1.0	1.45	1.45
Small Burnett	1.0	0.85	0.85
Blue Flax	1.0	6.00	6.00
Wyoming Big Sage	0.5	42.00	21.00
True Mountain Mahogany	0.5	31.00	15.50
Forage Kochia	0.5	17.00	8.50
Antelope Bitterbrush	0.5	19.00	9.50
Fourwing Saltbush	1.0	7.00	7.00
Total	8		74.40

* Costs from Granite Seed 7-22-96

PJ Treatment Maintenance

Project Description: Complete a mechanical retreatment and reseeding project to maintain forage production and optimum forage/cover ratios on previously treated areas. Reseed high value browse, forb and grass species to assure establishment of desired forage important on winter and spring big game range.

Equipment Operation Costs: 46.00 per acre
1 D-8 crawler tractor @ 105.00 per hour, 20 acres per day
Estimated Mobilization Costs: 400.00
Cost of seed: 114.90 per acre

Administration Cost 50.00 per acre

Total Project Costs per Acre (Based on 100 acre project)....................210.90

Typical Seed Mix

	Lbs/Acre	Cost/Lb*	Cost/Acre
Western Wheatgrass	0.5	2.60	1.30
Thick Spick Wheatgrass	0.5	3.90	1.95
Intermediate Wheatgrass	0.5	1.10	0.55
Hard Sheep Fescue	0.5	1.60	0.80
Ladak Alfalfa	1.0	1.45	1.45
Small Burnett	1.0	0.85	0.85
Blue Flax	1.0	6.00	6.00
Wyoming Big Sage	0.5	42.00	21.00
True Mountain Mahogany	1.0	31.00	31.00
Forage Kochia	1.0	17.00	17.00
Antelope Bitterbrush	1.0	19.00	19.00
Fourwing Saltbush	2.0	7.00	14.00
Total	10.5		114.90

* Costs from Granite Seed 7-22-96

Heavy Equipment Cost Estimates: Nelco Contractors Price, Utah (1996)

D6 Crawler Tractor with Operator	70.00 per hour
D8 Crawler Tractor with Operator	105.00 per hour